



Roll No									
---------	--	--	--	--	--	--	--	--	--

राष्ट्रीय प्रौद्योगिकी संस्थान गोवा

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

B.Tech

Programme Name: B.Tech

1st yr

Mid Semester Examinations, February-2019

(Batch B)

Course Name: Engineering Drawing

Course Code: ME100

Date: 01.03.2019

Time: 9- 10.30 am

Duration: 1 Hour 30 Minutes

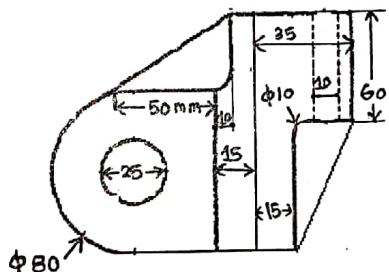
Max. Marks: 50

ANSWER ALL QUESTIONS

Please read the following instructions before solving:

1. Retain Construction lines
2. Line work and neatness carries weightage
3. Assume missing data if any

1. a) Draw the lines which is applicable to show (i) line of symmetry (ii) part of interrupted view and also mention its type of line b) Why projection of object in second and fourth quadrant are not in use for practical purpose? c) What are the recommended sizes of letters/numerals used for notes? (6M)
2. Correct the below figure and redraw it according to general rules for dimensioning. Also mention any two differences between the two methods of dimensioning. (8M)



3. A room is of size 6.5 m Length, breath 5 m and 3.5 m height. An electric bulb hangs 1m below the center of ceiling. Draw the projection of bulb in all planes. (8M)

4. A line KL 70mm long running due north east and parallel to VP. Draw its projections if the line is 20mm in front of VP and end K is 30mm above HP. (8M)

5. A line MN, inclined at 45° to the HP, measures 80 mm in TV. The end M is in the first quadrant and 24 mm and 14 mm from the HP and the VP respectively. The end N is at equal distances from both the reference planes. Draw the projections; find TL and true inclination with the VP. (10M)

6. An equilateral triangular thin plate of 40 mm side PQR is inclined at 45° to VP and perpendicular to HP. One of its sides is parallel to VP. Draw its projections if the corner P nearer to HP and 10 mm above the HP. (10M)



Roll No								
---------	--	--	--	--	--	--	--	--

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

Programme Name: B.Tech

Mid Semester Examination, February-2019

B.Tech

1st yr

(Batch B)

Course Name: Professional Communication-I

Course code: HU 100

Date: 28/02/2019

Duration: 1 hour 30 Minutes

Time: 9:30-11:00 a.m.

Max. Marks: 50

ANSWER ALL QUESTIONS

Instructions:

- Don't break the sequence of the Questions
- Do not write answer of the same question in parts at different places; the scattered parts will not be evaluated

1. Prepare a content for a non-commercial advertisement for the people of the state of Goa on behalf of State Transport Department. (5)

2. What is Listening skill and what are the different types? Which one or which of them are extremely relevant in a professional set up? (8)

3. NIT Goa received an award for Community Service Programme.
Prepare a journalistic content for The Goa Times. (5)

4. Make a precis of the following content with a suitable title. 2+6=8

Fair has attracted people for years. Its appeal is eternal. Fair is organized on the occasion of religious festival, cultural programme, and sporting event or to mark any ceremony.

It is a gathering crowd irrespective of cast, creed or religion. Now-a-days, its circumference has extended to the arena of science, technology, leather, garments and industry, etc. But the latest in addition is the book fair.

A book fair is like a feast of books. To eye books of so many varieties and that too in a large number at a time is really a wonderful experience. One can easily choose his liked one from the heap of novels, short stories, poems, maps, arts, dictionaries, cook books, encyclopedias, etc.

The book fairs showcases both Indian and international books. The publishers from foreign countries such as Germany, France, Bangladesh, Britain, etc. come to our country to display their books.

One can find attractive books written in different Indian languages and also Indian and foreign books either translated into English or other Indian languages. Books of the history, geography and culture of different parts of India are available in the fair. Thousands of people visit the fair, buy books and place order for more books.

In Delhi the world book fair is held at Pragati Maidan. The biggest world book fair is organized by Germany called the Frankfurt world book fair. In India, National Book Trust organizes several book-fairs in different states. The book fair is an appetizer for further reading.

That apart, a book fair has many more attraction. Famous writers sign autographs before selling their book on the spot. Cultural programme is staged every day. Furthermore, there are film shows, seminars and open debates too. But books have become very costly today. The government and publishers must look into the matter in order to help the readers collect their books of choice in a cost effective price to keep the attraction up for books.

5. Compare and contrast verbal and non-verbal communication? (8)
6. What are the barriers to Communication? (8)
6. Make meaningful sentences with the following group verbs:
a. Act on, b. Back off, c. Cater to, d. Call of, e. Let off, f. Do up, g. Get across, h. Fall out

Roll No								
---------	--	--	--	--	--	--	--	--



NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

B.Tech

Programme Name: B.Tech.

1st year

Mid Semester Examinations, February-2019

(Batch B)

Course Name: Computer Programming and problem solving
Date: 27th Feb 2019
Duration: 1 hour 30 Minutes

Course code: CS 100
Time: 2 PM
Max. Marks: 50

ANSWER ALL QUESTIONS

Part 1: Write a program for following questions. (4 x 5 =20 Marks)

- Accept a month in digit from the user. Display the month in words. If number is not between 1 and 12 display message "Invalid Month". (Use 'switch').
- Write a program in C to make such a pattern like right angle triangle.

```

1
0 1
1 0 1
0 1 0 1
1 0 1 0 1

```

- Write a C program to check whether a given number is palindrome or not.
- Write a program in C to count a total number of duplicate elements in an array.

Input: 1 2 1 4 2 3

Output: Total number of duplicate elements found in the array is: 2 elements (1, 2).

- Write a C program for swap three numbers using pointers.

Part 2: Write short note on following questions. (1*10=10 Marks)

- Why is indentation important? How carefully does the compiler pay attention to it?
- What is the difference between the break and continue statements?
- What do we mean by the "equivalence between pointers and arrays" in C?
- Can I use "int" data type to store the value 32768? Why?
- What is the significance of an algorithm to C programming?
- What is the advantage of an array over individual variables?
- What is debugging?
- What does the && operator do in a program code?
- What is || operator and how does it function in a program?
- Can the "if" function be used in comparing strings?

[P.T.O]

Part 3: Write down the outputs of the following C codes. (2*10=20)

1. int main() {
 int x = 2;
 switch (x) {
 x--;
 switch (x) {
 case 1:
 printf("Hello");
 break;
 case 2:
 printf("GFG");
 break;
 case 3:
 printf("Welcome");
 break;
 default:
 printf("BYE");
 }
 return (0);
}
2. int main() {
 int count;
 for (count = 0; count < 10; ++count) {
 printf("#");
 if (count > 6)
 continue;
 printf("%d", count);
 }
 return 0;
}
3. void main() {
 int ary[4] = {1, 2, 3, 4};
 int *p;
 p = ary + 3;
 *p = 5;
 printf("%d\n", ary[3]);
}
4. void main(){
 int i, j, a, n, number[6]={2,1,3,6,5,10}
 for (i = 0; i < n; ++i){
 for (j = i + 1; j < n; ++j) {
 if (number[i] < number[j]) {
 a = number[i];
 number[i] = number[j];
 number[j] = a;
 }
 }
 }
}
5. void main(){
 int i, j, rows=5;
 for(i=1; i<=rows; ++i) {
 for(j=1; j<=i; ++j) {
 printf("%d ",j);
 printf("\n");
 }
 }
}
6. void main() {
 int i, j, rows=5, number=1;
 for(i=1; i <= rows; i++) {
 for(j=1; j <= i; ++j) {
 printf("%d ", number);
 ++number;
 }
 printf("\n");
 }
}
7. void main(){
 int i,j,c='A';
 for(i=5;i>=1;i--) {
 for(j=0;j< i;j++)
 printf("%c ",(c+j));
 printf("\n");
 }
}
8. void main(){
 int cnt=1;
 do {
 printf("%d,",cnt);
 cnt+=1;
 }while(cnt>=10);
 printf("\nAfter DWloop cnt=%d",cnt);
 while(cnt>=10) {
 printf("%d,",cnt);
 cnt+=1;
 }
 printf("\nAfter wloop cnt=%d",cnt);
}
9. int main(){
 int *ptr; int x;
 ptr = &x; *ptr = 0;
 printf(" x = %dn", x);
 printf(" *ptr = %dn", *ptr);
 *ptr += 5;
 printf(" x = %dn", x);
 printf(" *ptr = %dn", *ptr);
 (*ptr)++;
 printf(" x = %dn", x);
 printf(" *ptr = %dn", *ptr);
 return 0;
}
10. int main(){
 int a[] = {0, 1, 2, 3, 4};
 int *p[] = {a, a + 1, a + 2, a + 3, a + 4};
 int **ptr = p;
 ++*ptr;
 printf("%d %d %d",*ptr-p,*ptr-a, **ptr);
 return 0;
}



Roll No									
---------	--	--	--	--	--	--	--	--	--

राष्ट्रीय प्रौद्योगिकी संस्थान गोवा

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

B.Tech 1st year
(Batch B)

Programme Name: B.Tech

Mid Semester Examinations, February-2019

Course Name: Engineering Mechanics

Course Code: ME100

Date: 26.02.2019

Time: 2-3.30 pm

Duration: 1 Hour 30 Minutes

Max. Marks: 50

ANSWER ALL QUESTIONS

1. A particle moves along the s-direction with constant acceleration. The displacement measured from a convenient position is 2m at time $t=0$ and is zero when $t=10s$. If the velocity of the particle is momentarily zero when $t=6s$, determine the acceleration and the velocity when $t=10s$. (7M)

2. A force of 1000N in a particular direction must be applied to tow a boat. For some reason, it is not possible to apply the force in that direction but two forces can be applied to 30° and 45° on either side of it in the same plane containing the given force. Determine the magnitude of the forces required along these directions. Solve it by two different ways. (8M)

3. (i) Three external forces acting on a L shaped body shown in figure 1. Determine the equivalent system through point O. (ii) What is difference between particle and rigid body explains with example. (8M)

4. A system of parallel force is acting on a rigid bar as shown in figure 2. Reduce the system to i) a single force (ii) a single force and a couple at A (iii) a single force and a couple at B and also represent the result by diagram. (8M)

5. (i) A frustum of a solid right circular cone has an axial hole of 50 cm diameter as shown in Figure 3. Determine the centre of gravity of the body. Take the base of the cone and center of the cone as axis of reference. (ii) State perpendicular axis theorem. (7M)

6. For an 80N squeeze on the handles of the pliers, determine the force F applied to the round rod by each jaw as shown in figure 4. In addition, calculate the force supported by the pin at A. (6M)

7. (i) A beam AB of 6 m length is loaded as shown in Figure 5. Determine the reactions of the beam at A and B. (ii) What is a statically determinate beam? (6M)

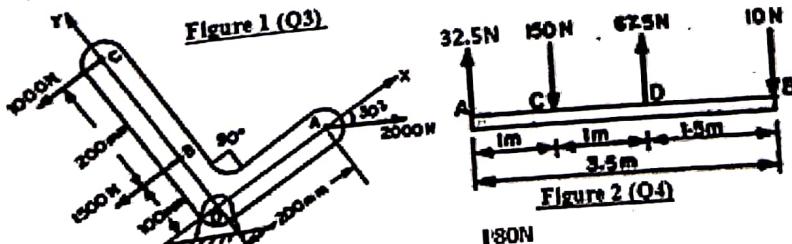
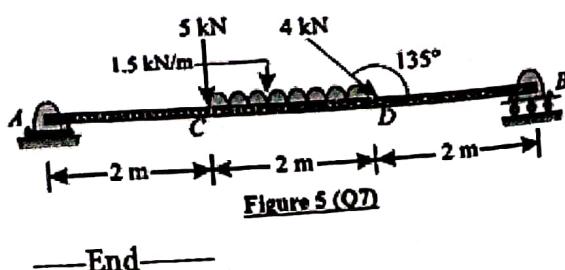
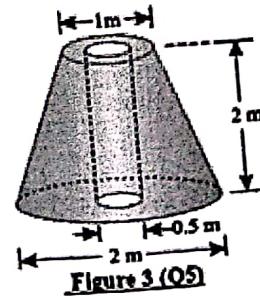
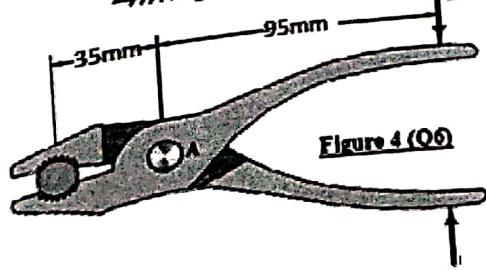


Figure 4 (Q6)



End

Roll no								
---------	--	--	--	--	--	--	--	--



राष्ट्रीय प्रौद्योगिकी संस्थान गोवा

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Department of Applied Sciences

Programme Name: B.Tech

Mid Semester Examination,

February-2019

B.Tech
(Batch II)B

Course Name: Physics

Date: 26/02/2019

Duration: 1 Hour 30 Minutes

Course Code: PH100

Time: 9.30 – 11.00 AM

Max. Marks: 50

ANSWER ALL QUESTIONS

- State and explain the Heisenberg's uncertainty principle and using this
 - To find the minimum energy of a Harmonic Oscillator.
 - To prove the non-existence of electron inside the nucleus (explain based on both relativistic and Non relativistic methods)
- Explain the duality of matter waves from the inferences drawn from photoelectric effect and G.P Thompson effect.
- A wave given by an equation $Y = A \sin(\omega t - kx)$ represent a particle? Explain the concept of a wave packet. How does this concept lead to Heisenberg's uncertainty principle?
- An electron and a 150 gm baseball are travelling at a velocity of 220 m/s, measured to an accuracy of 0.065%. Calculate and compare uncertainty in position of each.
- Determine the energy of a photon and the number of photons emitted per second by a $P = 2 \text{ mW}$ He-Ne laser that operates on the wavelength $\lambda = 632.8 \text{ nm}$. Interpret the results.
- An electron beam is accelerated from rest through a potential difference of 200 V.
 - Calculate the associated wavelength.
 - This beam is passed through a diffraction grating of spacing 3 Å. At what angle of deviation from the incident direction will be the first maximum observed?
- Describe an experiment which proves the validity of de-Broglie hypothesis regarding wave nature of matter.
- How could Davisson and Germer be sure that the peak obtained for 54 volts electron was a first order diffraction peak?
- Calculate the uncertainty in position of electron if uncertainty in its velocity is (i) 0.001% and (ii) Zero, velocity of electron is 300m/s.

*** All the best ***

Roll No.								
----------	--	--	--	--	--	--	--	--



राष्ट्रीय प्रौद्योगिकी संस्थान गोवा

National Institute of Technology Goa

B. Tech

1st yr

(Batch A)

Programme name: B Tech

Mid semester Examinations, February 2019

Course Name: Elements of Mechanical Engineering

Course Code: ME150

Date: 01/03/2019

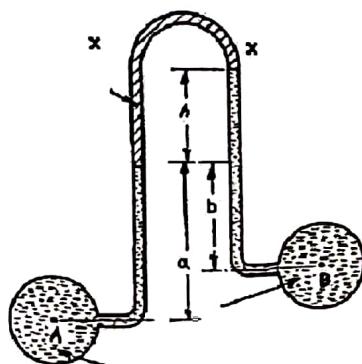
Time: 9 30 am – 11am

Duration: 1 Hour 30 minutes

Max. Marks: 50

ANSWER ALL QUESTIONS

- In a certain steam plant, the turbine develops 960 kW. The heat supplied to the steam in boiler is 2730 kJ/kg, the heat rejected by the steam in condenser is 2050 kJ/kg and the feed pump work required to pump the condensate back into the boiler is 6 kW. With a neat schematic diagram of steam plant, find the steam flow rate and the thermal efficiency of the plant [6]
- Efficiency of a heat engine is η . N such engines are arranged in series such that the heat absorbed by the second engine is same as that rejected by the first, heat absorbed by the third engine is same as that rejected by the second and so on. Find the overall efficiency. [6]
- Air at 3 bar, 90 m/s and 150 °C expands to 1 bar in an adiabatic nozzle. In the process specific volume of air increases by a factor of 1.5. What is the velocity of air at exit of nozzle? (Take $C_p = 1.005 \text{ kJ/kgK}$) [6]
- Work is done on an adiabatic system due to which its velocity changes from 10 m/s to 20 m/s, elevation increases by 20 m and temperature increases by 1 K. The mass of the system is 10 kg. If there is no change in any other component of energy of the system, what is the magnitude of total work done (in kJ) on the system. (Take $C_v = 100 \text{ J/kgK}$ and $g = 10 \text{ m/s}^2$) [6]
- Prove that the enthalpy values of inlet and exit of a throttling valve are same. [3]
 - Substantiate with reason whether temperature increase or decrease after throttling process. [3]
 - Explain with reason, what will happen to the temperature of an ideal gas if it undergoes a throttling process. [2]
- An inverted U tube as shown in figure below is used to measure the pressure difference between two points A and B which has water flowing. The difference in level $h = 0.3 \text{ m}$, $a = 0.25 \text{ m}$ and $b = 0.15 \text{ m}$. Calculate the pressure difference $P_B - P_A$, if the top of the manometer is filled with
 - air (density = 1.225 kg/m^3)
 - oil of relative density 0.8



PTO

7. 2 kg of air contained in a cylinder is compressed by a piston in an adiabatic process such that its [10] temperature is raised from 30°C to 250°C . The piston is then locked in position and 2154.6 kJ of heat is added. The piston is then released and performs works in adiabatic expansion process. Finally, the piston is locked in position to dissipate 1745.89 kJ of heat in another process such that the air completes thermodynamic cycle. Treating air as ideal gas, draw the PV diagram, work and heat interaction of each process and tabulate it. (Take $C_v = 0.718 \text{ kJ/kg}$)

ALL THE BEST

PTO

Roll No. []



National Institute of Technology Goa

Farmagudi, Ponda, Goa 403401

B.Tech

1st yr

(Batch A)

Programme Name: B.Tech.

Mid Semester Examination, Feb. 2019

Course Name: Basic Electrical Science

Course Code: EE151

Date: 28th Feb. 2018

Time: 2:00 p.m. - 03:30 p.m.

Duration: 1 Hour 30 minutes

Max. Marks: 50

1. Answer all questions. Each answer should be supported by proper justification.
2. All the figures should have proper labeling.
3. Assume appropriate conditions wherever necessary.
4. If there is any mistake in any question, it has to be found out with justification to score full marks.

Part A

1. Answer the following questions.

[2 × 10 = 20]

- (a) If it takes 35 J of energy to move a charge of 5 C from one point to another, what is the voltage between the two points?
- (b) The charge passing through a wire is $q(t) = (80t + 20)$ C. What is the current?

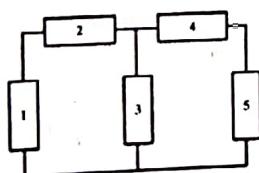


Figure 1: A network

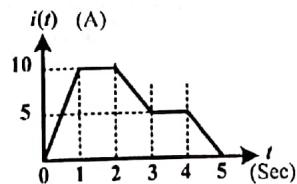


Figure 2: A current waveform

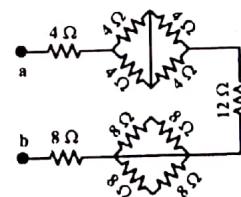


Figure 3: A network

- (c) Fig. 1 shows a circuit with five elements. Calculate the power p_3 received or delivered by element 3, if $p_1 = -205$ W, $p_2 = 60$ W, $p_4 = 45$ W, $p_5 = 30$ W.
- (d) The current through an inductor (1 mH) is shown in Fig. 2. Draw the corresponding voltage across the inductive element.
- (e) Find R_{eq} at terminals a-b for the circuit shown in Fig. 3.
- (f) Given two pieces of copper wire which have the same cross-sectional area, determine the relative resistance of the one which is twice as long as the other.

- (g) The voltage drops across each of the three series connected resistors are measured to be 10 V, 15 V, and 25 V. If the largest resistor is $47 \text{ k}\Omega$, determine the value of the lowest resistor.
- (h) Three resistors of equal resistance ($R \Omega$) are connected in delta. What is the resistance between any two points of the delta?
- (i) A $20 \mu\text{F}$ capacitor is linearly charged from 0 to $400 \mu\text{C}$ in 5 ms. Find the voltage function across the capacitor.
- (j) State the 'Thevenin's Theorem'.

Part B

2. Two 12 V dc voltage sources with internal series resistances of 0.2Ω and 0.25Ω respectively are joined in parallel and a resistor of 1Ω is placed across the terminals. Find the current applied by each voltage source. $[2 \times 2.5 = 5]$
3. What is the difference of potential between the point X and Y (v_{XY}) in Fig. 4. If 7Ω resistor is replaced by a 3Ω resistor, what will be the value of v_{XY} ? $[3 + 2 = 5]$
4. Using mesh analysis, determine the current flowing through the 3Ω resistor as shown in Fig. 5. $[5]$

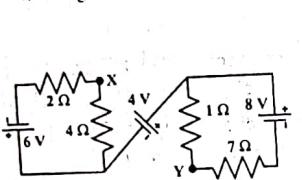


Figure 4: A network

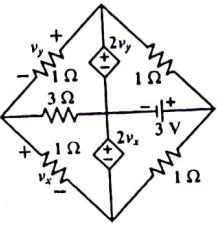


Figure 5: A bridge circuit

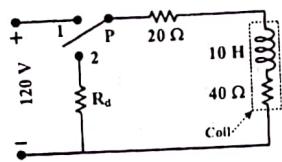


Figure 6: A network

5. In the circuit shown in Fig. 6, the point 'P' is initially in position '1'. The coil consists of a 10 H inductor with a resistor of 40Ω as shown in the figure. $[2 + 3 = 5]$

- (a) Calculate the value of R_d for the voltage across the coil to be 120 V at the instant at which the position of 'P' is changed to position '2'.
- (b) With R_d of the value found in Prob. (5a), find the time taken to dissipate 95% of the stored energy.

Part C

6. A charged capacitor (C_1) is connected to a discharged capacitor (C_2) of n times the capacitance by a resistor (R). $[4 + 2 + 4 = 10]$
- (a) Show that the final voltage across the two capacitors is independent of the value of the resistor.
- (b) What fraction is the final voltage of the original voltage across the first capacitor?
- (c) What fraction of the energy originally stored in the first capacitor is lost?

----- All The Best -----



राष्ट्रीय प्रौद्योगिकी संस्थान गोवा

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Department of Applied Sciences

Programme Name: B.Tech

Course Name: Materials Science

Date: 28/02/2019

Duration: 1 Hour 30 Minutes

February-2019

B.Tech

1st yr

(Batch A)

Course Code: PH150

Time: 9.30 - 11.00 AM

Max. Marks: 50

ANSWER ALL QUESTIONS

- What is Madelung constant? Show that the Madelung constant for a one-dimensional array of ions of alternating sign with a distance between two successive ions is equal to $2 \log 2$. (8M)
- Assume that the energy of two particles in the field of each other is given by the following function:

$$U(r) = -\frac{a}{r} + \frac{b}{r^8}$$

Where a and b are constants and r is the distance between the centers of the particles.

- Show that if the particles are pulled apart, the molecule will break as soon as

$$r = r_0 = \left(\frac{8b}{a}\right)^{1/7} = r_0[4.5]^{1/7}.$$

- Prove that in the stable configuration, the energy of attraction is 8 times the energy of repulsion.

$$\text{c) Show that the minimum force required to break the molecule is } \frac{a^{9/7}}{(36b^{2/7})} \left[1 - \frac{8}{36}\right]$$

- (a) Derive planar density expressions for FCC (100) and (111) planes in terms of the atomic radius R .
(b) Compute and compare planar density values for these same two planes for nickel (atomic radius for nickel is 0.125 nm) (5M)

- If the average energy required for producing a Schottky defect is 1.97 eV in the ionic crystal NaCl, calculate the density of Schottky defects at 27 °C. Given that the interatomic distance is 2.82 Å. (4M)

- Explain the following with proper diagram.

- Line Defects
- Edge dislocation
- Screw dislocation
- Grain boundaries

- What is meant by "Symmetry elements" in crystals? Discuss the various types of symmetry elements and symmetry operations present in a cubic crystal. (5M)

- What are crystal defects? Mention the different kinds of crystal imperfection. Obtain an expression for the equilibrium concentration of Frenkel defects at a given temperature in an ionic crystal. (6M)

- Copper has FCC structure and the atomic radius is 0.1278 nm. Calculate the interplanar spacing for (111) and (321) planes. (4M)

*** All the best ***

Roll No					
---------	--	--	--	--	--



National Institute of Technology Goa

Mid-Semester Examination

B.Tech. Programme, 2018-2019

B.Tech
(Batch A & B)
I^uyr

Course Name: Mathematics - II

Date: 27-02-2019

Duration: 90 Minutes.

Course Code: MA150

Time: 9.30 AM

Max. Marks: 50

ANSWER ALL QUESTIONS

1. Solve: $(x^2y^2 + y)dx + (2x^3y - x)dy = 0$.

2. Solve the differential equation: $(1 - x^2)y' + xy = y^3 \sin^{-1} x$. [4]

3. If the temperature of the air is 20°C and the temperature of the body drops from 100°C to 80°C in 10 minutes. What will be its temperature after 20 minutes. When will be the temperature 40°C . [4]

4. Discuss the existence and unique solution for the IVP [4]

$$y' = 2y/x, y(x_0) = y_0. [4]$$

5. Solve the following initial value problem by reducing into first order equation

$$y'' - y' - 2y = 0, y(0) = \alpha, y'(0) = 2. [4]$$

Find α so that the solution approaches zero as $t \rightarrow \infty$.

6. Prove that: "All bases for a vector space have the same number of vectors."

7. Find two vectors \vec{v} and \vec{w} that are perpendicular to $(1, 0, 1)$ and to each other. [2.5]

8. For each integer n , let $A_n = \begin{pmatrix} 1-n & -n \\ n & 1+n \end{pmatrix}$ prove that $A_n A_m = A_{n+m}$. Find the inverse of A_n . [2.5]

Do the same for the matrix $B_n = \begin{pmatrix} 1-2n & n \\ -4n & 1+2n \end{pmatrix}$. What is the inverse of $A_n B_m$? [5]

9. Are the vectors $(1, 1, 2, 4), (2, -1, -5, 2), (1, -1, -4, 0)$ and $(2, 1, 1, 6)$ are linearly independent in \mathbb{R}^4 ? Find the basis for the subspace spanned by these vectors. [5]

10. Find the inverse of the matrix: $A = \begin{pmatrix} 1 & 1/2 & 1/3 \\ 1/2 & 1/3 & 1/4 \\ 1/3 & 1/4 & 1/5 \end{pmatrix}$ [5]

11. Suppose $A = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 4 & 1 \end{pmatrix} \begin{pmatrix} 4 & 2 & 0 & 1 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 0 \end{pmatrix}$ [5]

- (a) What is the rank of A ?
- (b) Find the basis and dimension of all the fundamental subspaces of A . Justify.
- (c) Check that the solutions to $Ax = 0$ are perpendicular to the rows.

12. Using the LU -decomposition, solve the system: [5]

$$x + y + z = 6$$

$$x + 2y + 3z = 14$$

$$x + 3y + 6z = 25$$

* * * ALL THE BEST * *



Roll no _____

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa 403 401

1st yr B.Tech
(Batch A)

Programme Name: B.Tech

Mid Semester Examination, February-2019

Course Name: Chemistry
Date: 26/02/2019
Duration: 1 hour 30 Minutes

Course Code: CY150
Time: 9:30 AM
Max. Marks: 50

1. Answer all the questions
2. Answer for sub questions has to be labeled properly
3. Find reduction potential data as an annexure

1. Industrially, copper is purified by electrolysis. The impure copper acts as the anode, and the cathode is made of pure copper. The electrodes are immersed in a CuSO₄ solution. During electrolysis, copper at the anode enters the solution as Cu²⁺ while Cu²⁺ ions are reduced at the cathode. (a) Write half-cell reactions and the overall reaction for the electrolytic process. (b) Suppose the anode was contaminated with Zn and Ag. Explain what happens to these impurities during electrolysis. (c) How many hours will it take to obtain 1.00 kg of Cu at a current of 18.9 A? 5 Marks
2. Lead storage batteries are rated by ampere hours, that is, the number of amperes they can deliver in an hour. (a) Show that 1A.h = 3600 C. (b) The lead anodes of a certain lead-storage battery have a total mass of 406 g. Calculate the maximum theoretical capacity of the battery in ampere hours. (c) Calculate E°_{cell} and ΔG° for the battery. 5 Marks
3. Based on the standard reduction potentials in annexure, calculate the standard reduction potential for the half-reaction 4 Marks
$$\text{Fe}^{3+}(\text{aq}) + 3\text{e} \rightarrow \text{Fe}(\text{s}) \quad E^\circ = ?$$
4. Calculate the equilibrium constant for the following reaction at 298 K 4 Marks
$$\text{Zn}(\text{s}) + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{Cu}(\text{s})$$
5. A concentration cell ceases to operate when the concentrations of the two cell compartments are equal. At this stage, is it possible to generate an emf from the cell by adjusting another parameter without changing the concentrations? Explain. 3 Marks
6. A piece of magnesium ribbon and a copper wire are partially immersed in a 0.1 M HCl solution in a beaker. The metals are joined externally by another piece of metal wire. Bubbles are seen to evolve at both the Mg and Cu surfaces. (a) Write equations representing the reactions occurring at the metals. (b) What visual evidence would you seek to show that Cu is not oxidized to Cu²⁺? (c) At some stage, NaOH solution is added to the beaker to neutralize the HCl acid. Upon further addition of NaOH, a white precipitate 5 Marks

it
re
he
A
eat

forms. What is it?

7. A spoon was silver-plated electrolytically in an AgNO_3 solution. (a) Write the diagram for the process. (b) If 0.884 g of Ag was deposited on the spoon at a constant current of 18.5 mA, how long (in minutes) did the electrolysis take? 4 Marks
8. In an electrolysis experiment, a student passes the same quantity of electricity through two electrolytic cells, one containing a silver salt and the other a gold salt. Over a certain period of time, she finds that 2.64 g of Ag and 1.61 g of Au are deposited at the cathodes. What is the oxidation state of gold in the gold salt? 5 Marks
9. Explain cold and hot soda lime process with proper chemical equation and diagram 5 Marks
10. What are zeolites and explain the zeolite process of water treatment with proper chemical equation and diagram. 5 Marks
11. Explain with proper chemical equation, advantage and disadvantage of the following (a) Carbonate conditioning, (b) Phosphate conditioning (c) Calgon conditioning of the water. 5 Marks

Roll No								
---------	--	--	--	--	--	--	--	--



NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

Programme Name: B.Tech.

1st year

1st Sem

Section: B

Mid Semester Examinations, September-2018

Course Name: Elements of Mechanical Engineering

Course Code: ME150

Date: 01.10.2018

Time: 11:30AM

Duration: 1.5 Hours

Max. Marks: 50

ANSWER ALL QUESTIONS

- Define a thermodynamic system. Differentiate between open system, closed system and an isolated system. (5 marks)
- What is a quasi-static process? Explain briefly zeroth law of thermodynamics. (5 marks)
- Define the following (6 marks)
 - Enthalpy
 - Internal Energy
 - Specific heat at constant volume and
 - Specific heat at constant pressure.
- Air at 1.02 bar, 22°C, initially occupying a cylinder volume of 0.015 m³, is compressed reversibly and adiabatically by a piston to a pressure of 6.8 bar. Calculate: (i) The final temperature; (ii) The final volume; (iii) The work done. (6 marks)
- A cylinder contains 0.5 m³ of air at 1 × 10⁵ N/m² and 90°C. The air is compressed to a volume of 0.125 m³ the final pressure being 6 × 10⁵ N/m². Determine (i) The mass of air, (ii) The value of index 'n' for compression, (iii) The increase in internal energy of air (iv) The heat rejected or received by air during compression. (8 marks)
- Give the following statements of second law of thermodynamics. (4 marks)
 - Clausius statement
 - Kelvin-Planck statement.
- Define heat engine, refrigerator and heat pump. (6 marks)
- A cyclic heat engine operates between a source temperature of 800 °C and a sink temperature of 30 °C. What is the least rate of heat rejection per kW net output of the engine? (5 marks)
- A domestic food refrigerator maintains a temperature of -12 °C. The ambient air temperature is 35 °C. If heat leaks into the freezer at continuous rate of 2 kJ/s. Determine the least power necessary to pump this heat out continuously. (5 marks)

it
ne
he
A
eat

Roll No							
---------	--	--	--	--	--	--	--



NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

1st year

Programme Name: B.Tech.

1st Sem

Mid Semester Examinations, September-2018

Section : B

Course Name: Computer Programming & Problem Solving

Course Code: CS100

Date: 25-09-18

Time: 4.00 PM-5.30 PM

Duration: 1.5 Hours

Max. Marks: 50

ANSWER ALL QUESTIONS

1a. Give the structure of C program. Also explain each section in detail.

1b. What will be the output of following program? Explain

(5+1+1.5+1+1.5)

```
#include <stdio.h>
main () {
int x=100;
printf("%d\n", 10 + x++);
printf("%d\n", 10 + x++);
}
```

PS_Q1b_1

```
#include <stdio.h>
int main () {
int i=1;
for (i = 0; i = -1; i = ++1)
{ printf ("%d ", i);
if (i != 1) break;
}
return 0;
}
```

PS_Q1b_2

```
#include <stdio.h>
void main () {
int x=10;
if (x == 20) printf ("True");
else printf (" False")
}
```

PS_Q1b_3

```
#include <stdio.h>
main () {
char ch = 'a';
switch (ch)
{
case 'a':
printf("a");
case 'b':
printf("b");
default :
printf("c");
}
}
```

PS_Q1b_4

2a. Write a C program to check whether the given year is a leap year or not.

(5+5)

2b. Write a program to print the multiplication table from 1 to 20.

3a. Why escape sequences are required in C programming? Explain the following escape sequences:

- i. \t ii. \v iii. \\ iv. \"

3b. Write scanf statements to read the following data list:

- i. 50, 2.0+e01 ii. B, 60B

3c. Explain the following statements with necessary example:

- i. continue ii. break iii. define

(5+2+3)

4a. Write a C program to compute the Sine(X) upto term accuracy is 0.0001.

(5+5)

4b. Write a C program to compute the roots of a quadratic equation.

5a. Explain the bidirectional and multi-directional conditional statements with necessary general syntax. Also, write a C program to convert a given decimal number into its octal equivalent using multi-directional conditional statement.

I
t
re
he
A
eat

5b. What are the different data types of C programming? Explain each of them. Also, give the control strings used for each of the data types while reading the data using scanf statement.

(5+5)

----- ALL THE BEST -----



Roll No. _____

National Institute of Technology Goa

Programme Name: B.Tech., I Sem

Mid Semester Examinations, September 2018

1st yr
1st Sem
Section : B

Course Name: Basic Electrical Science

Date: 25 September 2018

Duration: 1.5 Hours

Course Code: EE151

Time: 4:00 - 5:30 P.M

Max. Marks: 50

ANSWER ALL THE QUESTIONS TO THE POINT

1. Find the value of 'R' and the current flowing through it in the circuit shown in Fig. 1, when the current in the branch OA is zero. [3 M]

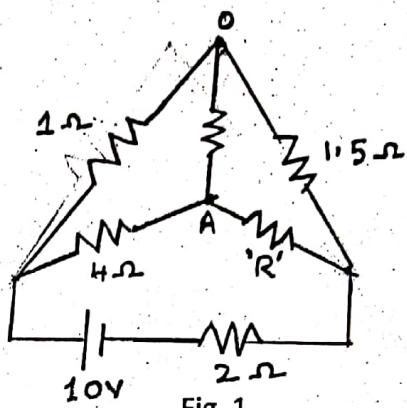


Fig. 1.

2. When a resistor is placed across a 415 V supply, a current of 36A flows. What is the value of the resistor that must be placed in parallel to increase the current to 40A. [2 M]

3. When a 10Ω load is applied to a unknown voltage source a current of 2.5A flows and when the load resistance is increased to 20Ω , the current drops to 2A. If a load of 15Ω is connected across the source, what is the voltage across is it? Also calculate the power delivered by the source. [6 M]

4. Find all the node voltages and currents in $\frac{1}{3}\text{ ohm}$ and $\frac{1}{5}\text{ ohm}$ resistances of figure 2. [5 M]

- a) Use Source transformation to solve this problem
- b) Use Super mesh analysis to solve this problem
- c) Use Superposition theorem to solve this problem

[6 M]

[7 M]

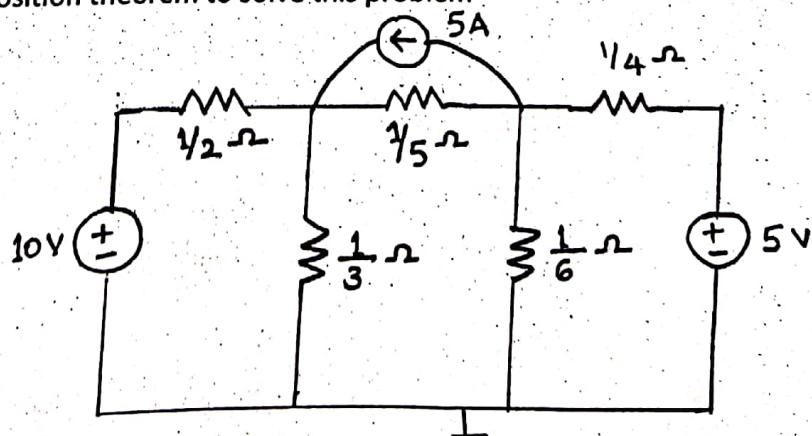


Fig.2.

figure below, determine
(a) nodal analysis

using

5. In the network shown in Figure 3, find the current delivered by the battery.

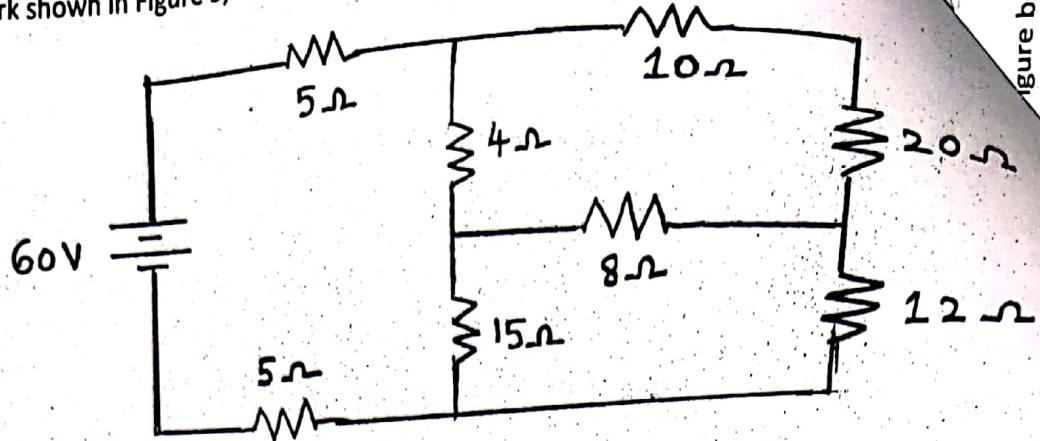


Fig.3.

6. For the circuit shown in Figure 4, find the current through the resistance 'R' connected between a and b using Thevenin's theorem. [6 M]

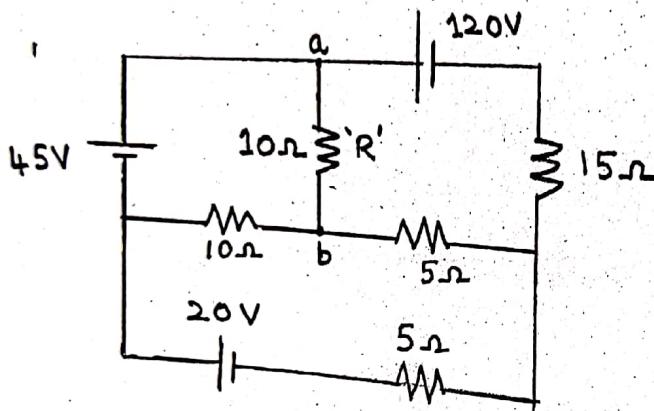


Fig.4.

7. Find independently the Thevenin's and Norton's equivalent of the circuit given in Fig.5. [5M * 2]

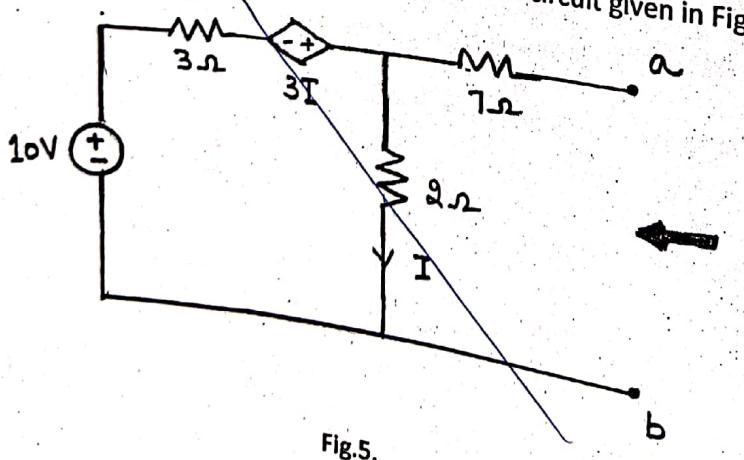
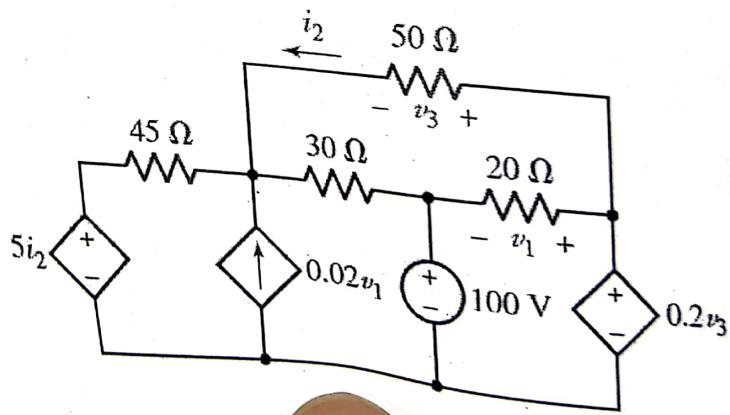


Fig.5.

Section : A

The Figure below, determine the total number of simultaneous equations that must be solved to determine voltages using
(a) nodal analysis; (b) mesh analysis.

[5M * 2]



1. Answer All Questions.
 2. For the True/False questions in Part A, justify your answer.
 3. No marks will be given if the explanation of your answer is missing.
 4. The question paper consists of two pages.
-

Part A

1. $f(x) = \sqrt[3]{x}$ is differentiable function at origin. (2)
2. The domain of a function $f(x, y, z) = \sqrt{\frac{x+y+z-1}{x^2+y^2+z^2-1}}$ is defined as $x+y+z \geq 1$, $x^2+y^2+z^2 > 1$. (2)
3. If $f(x, y) = 0$ then $\frac{d^2y}{dx^2} = -\frac{f_{xx}f_y^2 - 2f_{xy}f_xf_y + f_{yy}f_x^2}{f_y^2}$. (2)
4. The area of the region in the xy -plane bounded by the lemniscate $r^2 = a^2 \cos 2\phi$ is $\frac{a^2}{4}$. (2)
5. The volume of the region bounded by $z = x^2 + y^2$ and $z = 2x$ is $\frac{\pi}{2}$. (2)

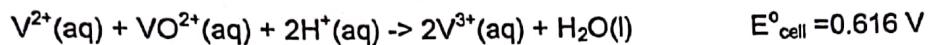
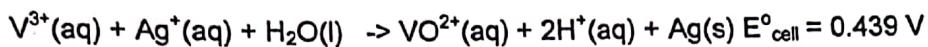
Part B

6. Use the definition of limit to find suitable δ of $f(x, y) = \begin{cases} \frac{xy^2}{x^2+y^2} & (x, y) \neq (0, 0) \\ 0 & (x, y) = 0 \end{cases}$ with $\epsilon = 0.04$ if limit exists at origin. (5)
7. Suppose $u = \frac{x^2 - y^2}{2}$ and $v = xy$ then prove that a function $w = f(u, v)$ satisfies the equation $w_{xx} + w_{yy} = 0$ whenever $f_{uu} + f_{vv} = 0$. (5)
8. Find a cubic approximation of $\sin xy$ about $(1, \frac{\pi}{2})$. (5)
9. Find the points on the surface $x^2 - zy = 4$ closest to the origin. (5)

10. Evaluate $\int_{-\infty}^{\infty} \int_{-\infty}^{\infty} e^{-x^2-y^2} dx dy$. Use the result to deduce the value of $\int_0^{\infty} e^{-x^2} dx$. (5)
11. Show that the following multiple integrals can be reduced to single integral.
$$\int_0^x \int_0^y \int_0^u e^{m(x-t)} f(t) dt du dv = \int_0^x \frac{(x-t)^2}{2} e^{m(x-t)} f(t) dt.$$
 (5)
12. Find the mass of the solid region in the first octant is bounded by the coordinate planes and the plane $x + y + z = 2$. (5)
13. Find the volume of the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ using the transformation $x = au$, $y = bv$ and $z = cw$ and method of triple integrals. (5)

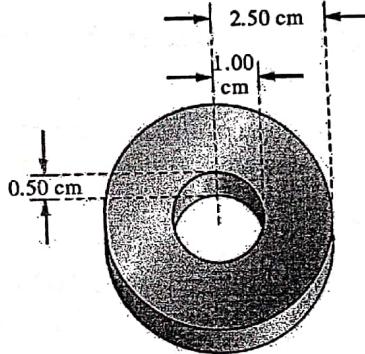
1. Answer all the questions
2. Answer for sub questions has to be labeled properly
3. Find reduction potential data as an annexure

1. Two voltaic cells are assembled in which the following reactions occur. 5 Marks



Use these data and other values from annexure to calculate E° for the half reaction of $V^{3+}(aq) + 1e \rightarrow V^{2+}(aq)$

2. A Ni anode and a Fe cathode are placed in a solution with $[Ni^{2+}] = 1M$ and then connected to a battery. The Fe cathode has the shape shown below. How long must electrolysis be continued with a current of 1.50 A to build a 0.050 mm thick deposit of nickel on the iron? (Density of nickel = 8.90 g/cm³.) 6 Marks



3. A solution containing both Ag^+ and Cu^{2+} ions is subjected to electrolysis. 5 Marks
Copper is plated out after a current of 0.75 A is passed through the solution for 2.50 hours. If the total mass of metal is 3.50 g, what is the mass percent of silver in the product?

4. Electrolysis is carried out for 2.00 h in the following cell. The silver cathode, which has a mass of 25.0782 g, weighs 25.8639 g after the electrolysis. The platinum anode weighs the same before and after the electrolysis. 5 Marks

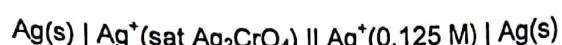
(a) Write plausible equations for the half-reactions that occur at the two electrodes.

(b) What must have been the magnitude of the current used in the

electrolysis (assuming a constant current throughout)?

(c) A gas is collected at the anode. What is this gas?

5. A voltaic cell is constructed as follows:



What is the value of E_{cell} ? For Ag_2CrO_4 , $K_{\text{sp}} = 1.1 \times 10^{-12}$.

6. For the voltaic cell,



(a) What is E_{cell} initially

(b) If the cell is allowed to operate spontaneously, will E_{cell} increase, decrease, or remain constant with time? Explain

7. (a) Using data available in Appendix, write the disproportionation reaction for $\text{Au}^+(\text{aq})$. From the appropriate standard potentials, determine whether Au^+ will disproportionate spontaneously in aqueous solution under standard conditions.

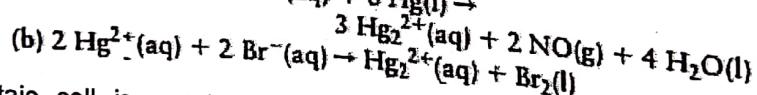
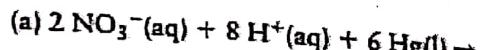
6 Marks

(b) Using data available in Appendix, write the disproportionation reaction for Sn^{2+} . (b) From the appropriate standard potentials, determine whether Sn^{2+} will spontaneously disproportionate in aqueous solution under standard conditions.

8. Use the data in Appendix to calculate the standard potential of the couple $\text{Au}^{3+}(\text{aq})/\text{Au}^+(\text{aq})$; $\text{Mn}^{3+}(\text{aq})/\text{Mn(s)}$ 4 Marks

9. For each reaction that is spontaneous under standard condition, write a cell diagram, determine the standard cell emf, and calculate ΔG° for the reaction. [4 Marks]

4 Marks



10. A voltaic cell is constructed from an $\text{Ni}^{2+}(\text{aq})/\text{Ni(s)}$ half-cell and an $\text{Ag}^+(\text{aq})/\text{Ag(s)}$ half-cell. The initial concentration of Ni^{2+} in $\text{Ni}^{2+}(\text{aq})/\text{Ni(s)}$ half-cell is 0.01M. The initial cell voltage is 1.12V. (a) By using data in annexure, calculate the standard emf of this voltaic cell. (b) Will the concentration of Ni^{2+} increase or decrease as the cell operates? (c) What is the initial concentration of Ag^+ in the Ag^+/Ag half-cell? 5 Marks



Roll no _____

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa 403 401

1st yr1st Sem

Section: A

Programme Name: B.Tech

Mid Semester Examination, September-2018

Course Name: Physics

Date: 25.09.2018

Duration: 1 Hour 30 Minutes

Course Code: PH100

Time: 11.30 AM

Max. Marks: 50

ANSWER ALL QUESTIONS

1. Discuss the failures of classical mechanics and how does quantum mechanics overcome these failures. (5M)
2. A light source of wavelength λ illuminates a metal and ejects photoelectrons with a maximum kinetic energy of 1.00 eV. A second light source with half the wavelength of the first ejects photoelectrons with a maximum kinetic energy of 4.00 eV. Determine the work function of the metal. (5M)
3. State and explain the Heisenberg's uncertainty principle and use it to (a) prove the non-existence of electron inside the nucleus (b) Find the minimum energy of a Harmonic Oscillator (c) Determine the size of a hydrogen atom. (10 M)
4. Derive the Compton formula. In a Compton collision with an electron, a photon of violet light ($\lambda = 400$ nm) is backward scattered through an angle 180° .
(a) How much energy is transferred to the electron in this collision?
(b) Compare the result with the energy the electron would acquire in a photoelectric process with the same photon.
(c) Could violet light eject electrons from a metal by Compton collision? Explain. (8M)
5. (a) Show that at low temperatures the Planks formula for radiated energy $E_\lambda d\lambda = \frac{8\pi hc}{\lambda^5} \times \frac{1}{e^{hc/\lambda kT} - 1} d\lambda$ reduces to the Wein's law i.e. $E_\lambda d\lambda = \frac{8\pi hc}{\lambda^5} \times e^{-hc/\lambda kT} d\lambda$
(b) Show that at large temperatures the Planks formula for radiated energy $E_\lambda d\lambda = \frac{8\pi hc}{\lambda^5} \times \frac{1}{e^{hc/\lambda kT} - 1} d\lambda$ reduces to the Rayleigh-Jeans approximation i.e. $E_\lambda d\lambda = \frac{8\pi kT}{\lambda^4} d\lambda$ (6M)
6. The filament of a light bulb is cylindrical with length $l = 20$ mm and radius $r = 0.05$ mm. The filament is maintained at a temperature $T = 5000$ K by an electric current. The filament behaves approximately as a black body, emitting radiation isotropically. At night, you observe the light bulb from a distance $D = 10$ km with the pupil of your eye fully dilated to a radius $p = 3$ mm.
(a) How much radiation power enters your eye?
(b) How many radiated photons enter your eye every second? You can assume that the average wavelength for the radiation is $\lambda = 600$ nm. (6M)
7. The phase velocity v_p and group velocity v_g are defined by the relations $v_p = \frac{\omega}{k}$ and $v_g = \frac{d\omega}{dk}$ show that for a de Broglie wave associated with a relativistic particle moving with velocity v ,
$$v_p = \frac{c^2}{v} \text{ and } v_g = v \quad (5M)$$
8. An oil drop of mass 10-12 gm is floating on the free surface of a liquid. At any instant the position of drop can be determined within the error of 10-14 cm. What will be the error in measurement of its velocity? (5M)

***All the best ***

Page 1 of 1

Section : A



Roll No							
---------	--	--	--	--	--	--	--

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

Programme Name: B.Tech
Mid Semester Examinations, September-2018

Course Name: Professional Communication-I
Course code: HU 100
Date: 22/09/2018
Duration: 1 hour 30 Minutes

1st year
1st Sem
Section: A

Time: 11:30: a.m. – 1:00 p.m.
Max. Marks: 50

Answer all the questions

Instructions:

- Kindly don't break the sequence of the Questions
- Do not write answer of the same question in parts at different places

Q.1. What is Grapevine? Why is it relevant in Professional Communication? (8)

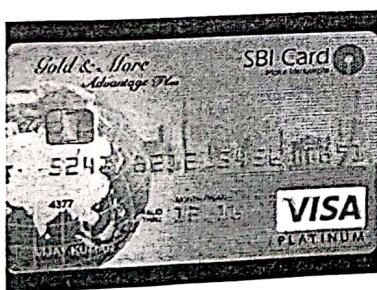
Q. 2. Write a short note on Listening? (8)

Q. 3. Compare and Contrast Hard Skills and Soft Skills? (8)

Q.4. Make a Precis of the following content and add a suitable title to it. (4+2=6)

Trees give shade for the benefit of others, and while they themselves stand in the sun and endure the scorching heat, they produce the fruit of which others profit. The character of good men is like that of trees. What is the use of this perishable body if no use is made of it for the benefit of mankind? Sandalwood, the more it is rubbed, the more scent does it yield. Sugarcane, the more it is peeled and cut up into pieces, the more juice does it produce. The men who are noble at heart do not lose their qualities even in losing their lives. What matters whether men praise them or not? What difference does it make whether they die at this moment or whether lives are prolonged? Happen what may, those who tread in the right path will not set foot in any other. Life itself is unprofitable to a man who does not live for others. To live for the mere sake of living one's life is to live the life of dog and crows. Those who lay down their lives for the sake of others will assuredly dwell forever in a world of bliss.

Q. 5. Prepare an Advertisement of the following SBI International Credit Card. (5)

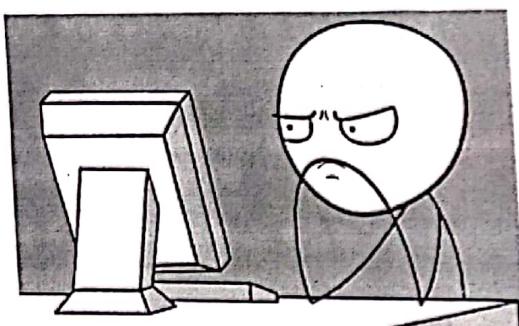


Q.6. Write a paragraph on the following topic: (4)

- Superstition

Q.7. Why is Proxemics important in the context of Professional Communication? Illustrate it with relevant example. (6)

Q.8. Analyse the image with reference to Feedback? (5)



1a. A resistance is connected across a DC supply. The value of the voltage was gradually increased. Draw Power Vs Voltage curve, with Voltage on X-axis and Power on the Y-axis. [2 M]

1b. Draw the V-I Characteristics of an Ideal and a practical Current Source, i.e $V(t)$ Vs $I(t)$ [2 M]

1c. The value of current flowing through 3 Ohm resistor in the circuit in Fig.1 is [4 M]

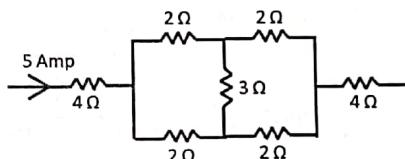


Fig.1.

1d. For the circuit shown in Fig.2, find the voltage V_x using nodal analysis. [10 M]

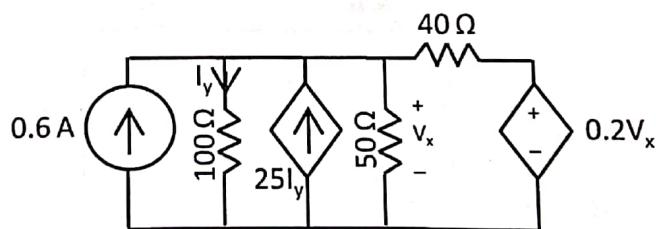


Fig.2

1e. Find the Thevenins equivalent of the following circuit across AB in Fig.3 [7 M]

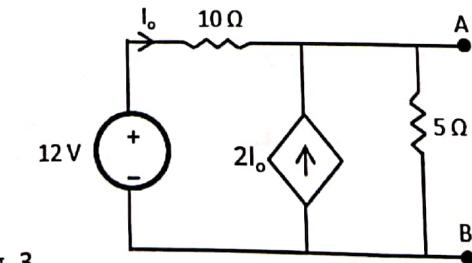


Fig. 3

2a. Compute the equivalent inductive reactance of the network in Fig.4

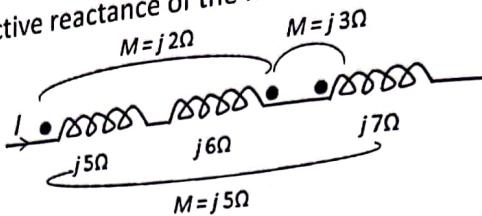


Fig.4

2b. For the voltage waveform shown in Fig.5, draw the current waveform for the given intervals of time, through an inductor of 0.5 H with $i_L(0) = -2A$

[4M]

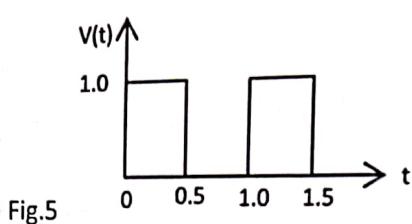


Fig.5

2c. The series circuit shown in Fig.6 has a current $i(t) = 2 \cos(5000t)$ Amps. The applied voltage $V(t)$ will be

[5 M]

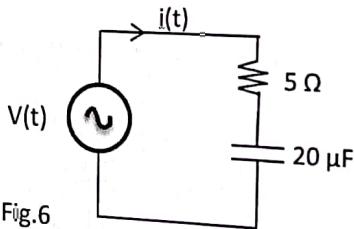


Fig.6

2d. Find the time constant of the circuit shown in Fig.7 (Hint: Thevenin's resistance across the capacitor is $R_{\text{equivalent}}$)

[4 M]

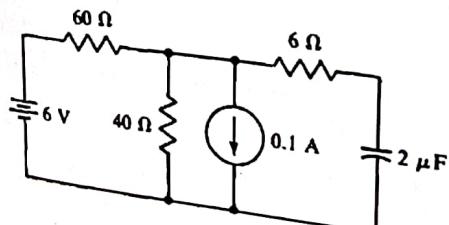


Fig.7

2e. The half-cycle of an alternating signal is in Fig. 8. Calculate the average and RMS value of the signal.

[10 M]

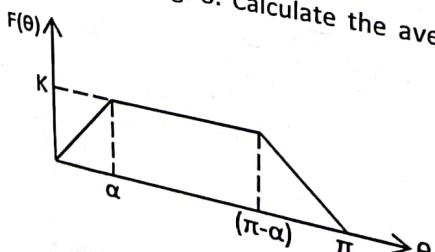


Fig.8

$$\begin{aligned} f(\theta) &= \frac{K\theta}{\alpha} & 0 < \theta < \alpha \\ &= K & \alpha < \theta < (\pi - \alpha) \\ &= \frac{K(\pi - \theta)}{\alpha} & (\pi - \alpha) < \theta < \pi \end{aligned}$$

3a. Explain the working of a P-N junction diode based Negative Clamper Circuit with a neat diagram. [5 M]

3b. The input voltage to a 2 level clipper shown in Fig.9, varies linearly from 0 to 150 V. Sketch the output voltage V_o to the same time scale as the input voltage. Assume ideal diodes. [5 M]

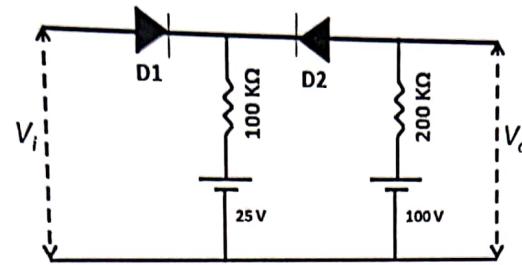


Fig.9.

3c. Consider a half wave bridge rectifier circuit, as shown in Fig.10. [1 + 1 + 2 + 2 + 2 + 1 + 1 + 1 M]

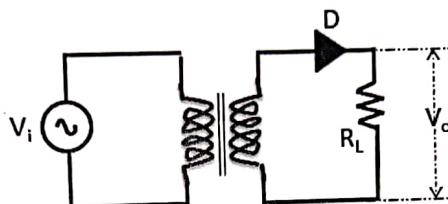


Fig.10.

- Draw the input voltage waveform
- Draw the output voltage waveform, and derive the following expressions from (iii - viii)
- Peak value of load current
- Average value of load current
- RMS value of load current
- DC power output
- AC power input
- Rectifier efficiency

3d. A sinusoidal voltage of amplitude 25 Volts and frequency 50 Hz is applied to a halfwave rectifier using PN diode. No filter is used and the load resistor is $1000\ \Omega$. The forward resistance R_f of ideal diode is $10\ \Omega$. Calculate [6 × 1M]

- Peak value of load current
- Average value of load current
- RMS value of load current
- DC power output
- AC power input
- Rectifier efficiency

4a. Carry out the following Number system conversions [2 × 2 M]

- $(528.96)_{10} = (\underline{\hspace{2cm}} \underline{\hspace{2cm}} \underline{\hspace{2cm}} \underline{\hspace{2cm}})_{16}$
- $(4672.56)_8 = (\underline{\hspace{2cm}} \underline{\hspace{2cm}} \underline{\hspace{2cm}} \underline{\hspace{2cm}})_{16}$

4b. Using Boolean algebraic truth table illustrate the following: [2 × 3 M]

- Commutative property
- Associative property

4c. Represent the Logic Symbol and Truth table for the following [2 × 3 M]

- a) NAND Gate
- b) EX-OR Gate

4d. Implement $Y = AC + ABC + \bar{A}BC + AB + D$, using only NAND and NOR gates [4M]

4e. Prove that $\overline{AB} + \bar{A} + AB = 0$ [3M]



Roll no								
---------	--	--	--	--	--	--	--	--

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Department of Applied Sciences

Programme Name: B.Tech

1st Year
1st Sem

End Semester Examination, November-2018

Course Name: Materials Science

Course Code: PH150

Date: 28/11/2018

Time: 9.30 A.M.- 12.30 P.M.

Duration: 3 Hours

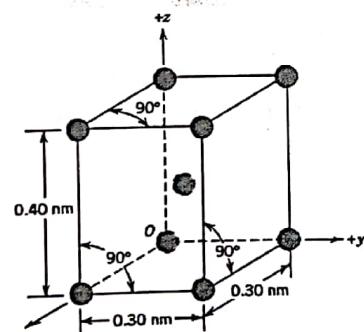
Max. Marks: 100

ANSWER ALL QUESTIONS

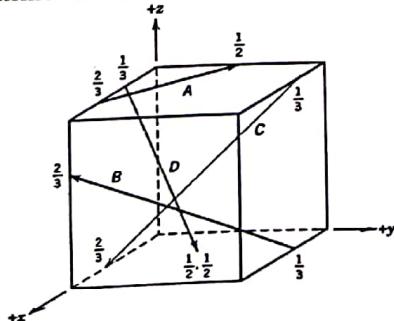
- a) Draw a schematic figure showing the structure of sodium chloride. Obtain an expression for the total cohesive energy of an ionic crystal in terms of the Madelung constant. (8M)
b) Assume that the energy of two particles in the field of each other is given by the following function of the distance r between the centers of the particles: (8M)

$$U(r) = -\frac{a}{r} + \frac{b}{r^8}$$

- Show that the two particles form a stable compound for $r = r_0 = \left(\frac{8b}{a}\right)^{1/7}$.
 - Show that the potential energy of the two particles in the stable configuration is equal to $-\left(\frac{7}{8}\right)\frac{a}{r_0}$.
 - Show that if the particles are pulled apart, the molecule will break as soon as $r = \left(\frac{36b}{a}\right)^{1/7}$ and that the minimum force required to break the molecule is $\frac{a^{9/7}}{(36b^{2/7})} \left[1 - \frac{8}{36}\right]$.
- a) The below figure shows a unit cell for a hypothetical metal. (3M)
 - To which crystal system does this unit cell belong?
 - What would this crystal structure be called?
 - Calculate the density of the material, given that its atomic weight is 141 g/mol.



- Determine the indices for the directions shown in the following cubic unit cell: (2M)

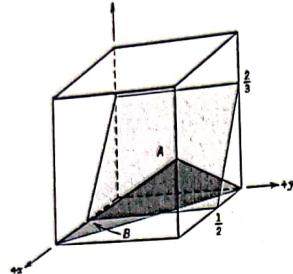


c) Sketch within a cubic unit cell the following planes
 $(11\bar{2}), (10\bar{2}), (\bar{1}2\bar{2})$ and $(\bar{1}2\bar{3})$

(2M)

d) What are the indices for the two planes drawn in the following sketch?

(2M)



3. a) For BCC iron, compute (i) the interplanar spacing and (ii) the diffraction angle for the (220) set of planes. The lattice parameter for Fe is 0.2866 nm. Also, assume that monochromatic radiation having a wavelength of 0.1790 nm is used, and the order of reflection is 1. (4M)
- b) Zirconium has an HCP (Hexagonal Close Packed) crystal structure and a density of 6.51 g/cm³. What is the volume of its unit cell in cubic meters? (4M)
- c) Calculate the equilibrium number of vacancies per cubic meter for copper at 1000 °C. The energy for vacancy formation is 0.9 eV/atom; the atomic weight and density (at 1000 °C) for copper are 63.5 g/mol and 8.4 g/cm³, respectively. (given $N_A = 6.022 \times 10^{23}$ atoms/mol and $k = 8.62 \times 10^{-5}$ eV/K) (4M)
- d) What are crystal defects? Mention the different kinds of crystal imperfection. Obtain an expression for the equilibrium concentration of Frenkel defects at a given temperature in an ionic crystal. (4M)
4. a) Derive expressions for (i) electrical conductivity and (ii) thermal conductivity on the basis of classical free electron theory. Hence obtain Wiedemann-Franz law (4M)
- b) Show that 1 eV is approximately equal to 23 Kcal/mol. (2M)
- c) A uniform copper wire of length 0.5 m and diameter 0.3 mm has a resistance of 0.12Ω at 293 K. If the thermal conductivity of the specimen at the same temperature is $390 \text{ W m}^{-1} \text{ K}^{-1}$, calculate the Lorentz number. (4M)
- d) How does the band theory of solids lead to the classification of solids into semiconductors and insulators? (4M)
5. a) Mark the fermi level for (i) an intrinsic semiconductor (ii) n-type semiconductor and (iii) p-type semiconductor. Describe the behavior and properties of conductors, insulators and semiconductors on the basis of band theory. (4M)
- b) In a P-type semiconductor, the Fermi level lies 0.4 eV above the valence band. If the concentration of the acceptor atom is tripled and $kT=0.03$ eV, find the new position of the fermi level. (4M)
- c) An intrinsic germanium semiconductor has a charge density of 2.4×10^{19} charges per m³ at 300 K. The material is made extrinsic with an indium P impurity at the rate of one indium atom per 4×10^8 germanium atoms. If there are 4.4×10^{28} germanium atoms per m³. Determine the concentration of minority charge carrier and discuss the result. (4M)

6. a) Draw the energy band diagram for (i) forward biased p-n junction and (ii) reverse biased p-n junction.
- b) The bulk of n-type region has a density of $10^4 \frac{s}{m}$ at 300 °K and of p-type region has a density of $10^4 \frac{s}{m}$ at 300 °K. Calculate the carrier mobility $\mu_h = 0.17 \text{ m}^2/\text{V.sec}$.
- c) A sphere of radius 'a' is suspended in a magnetic field \vec{B} and has a dipole moment \vec{D} . Calculate the force experienced by the sphere.
- d) When NaCl crystal is subjected to an electric field $E = 2.215 \times 10^{-7} \text{ C/m}^2$, the polarization is found to be 1.0. Calculate the dielectric constant of the crystal.
- e) What are intrinsically doped semiconductors? Explain each.
- f) Distinguish clearly between the expression of diamagnetic and paramagnetic susceptibility.
- g) A magnetic material has a magnetic susceptibility of Wb/m^2 . Calculate the magnetic field intensity if the magnetic induction is $B = 12.57 \times 10^{-2}$ T.
- h) Enumerate the properties of superconductors.

6. a) Draw the energy band diagrams of an (i) unbiased p-n junction, (ii) Forward biased p-n junction and (iii) reverse biased p-n Junction. (4M)
- b) The bulk of n-type region of a particular germanium junction has a conductivity of $10^4 \frac{S}{m}$ at $300^\circ K$ and of p-region is $10^2 \frac{S}{m}$. Find the voltage drop across the junction in equilibrium at $300^\circ K$. (Assuming, $n_l = 2.5 \times 10^{19}/cm^3$; $\mu_e = 0.36 m^2/V.sec$; $\mu_h = 0.17 m^2/V.sec$) (4M)
- c) A sphere of radius 'a' is polarized along the radius vector such that $\vec{P} = P_0 \vec{r}$. Determine ρ , σ , total charge, \vec{D} and \vec{E} . (4M)
- d) When NaCl crystal is subjected to an Electric Field of 50 V/cm. The resulting polarization is $2.215 \times 10^{-7} C/m^2$. Calculate relative permittivity of NaCl. ($\epsilon_0 = 8.85 \times 10^{-12} F/m$) (4M)
7. a) What are intrinsically conducting polymers? How they are classified and explain them with an example each. (3M)
- b) Distinguish clearly between diamagnetism, paramagnetism and ferromagnetism. Derive an expression of diamagnetic susceptibility on the basis of classical theory. (4M)
- c) A magnetic material has a magnetization of 2300 A/m and produces a flux density of 0.00314 Wb/m². Calculate magnetizing force and relative permittivity of the material. [$\mu_0 = 12.57 \times 10^{-7} H/m$] (4M)
- d) Enumerate the properties of type I and type II superconductors (4M)

*** All the best ***

Section : A

Section : B

Roll No								
---------	--	--	--	--	--	--	--	--



NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

Programme Name: B.Tech.

1st yr

1st Sem

End Semester Examinations, November-2018

Course Name: Elements of Mechanical Engineering

Course Code: ME150

Date: 30/11/2018

Time: 09.30 A.M. - 12.30 P.M.

Duration: 3 Hours

Max. Marks: 100M

ANSWER ALL QUESTIONS

PART- A (10x 5 =50 Marks)

1. What is meant by thermodynamic equilibrium? What is a Quasi – Static process?
2. Derive the expression of work transfer for an ideal gas in a polytropic process.
3. Define (i) enthalpy (ii) internal energy and (iii) specific heat at constant volume and constant pressure
4. Air in stationary system expands in a reversible adiabatic process from 0.5 MPa, 15°C to 0.2 Mpa. Find the final temperature and change in enthalpy, Internal Energy, heat transfer and work done per kg of air.
5. 1 kg of air at 1.02 bar, 20°C is compressed reversibly according to law $PV^{1.3} = \text{const.}$, to a pressure of 8.5 bar. Calculate the work done on the air and heat flow to or from the cylinder wall during the compression.
6. Discuss limitations of first law of thermodynamics.
7. What is a heat pump? How does it differ from refrigerator?
8. Give the statements of second law of thermodynamics.
9. What is the highest possible theoretical efficiency of heat engine operating with hot reservoir of furnace gases at 2100 °C when cooling water is available 15 °C?
10. A domestic food Refrigerator maintains a temperature of -12 °C. The ambient temperature is 35 °C. If heat leaks into the freezer at continuous rate of 2 kJ/s determine the least power necessary to pump this heat out continuously.

PART- B

(5 x 5 =25)

11. Answer the following:
 - a) Derive the relationship between load, shear force and the bending moment acting at a section on the beam subjected to a distributed load q_0 N/unit length.
 - b) What are the advantages of welding over other fastening methods?
 - c) State the functions of the following components of a centre lathe:
 - i. Feed shaft
 - ii. Lead screw
 - iii. Compound slide

iv. Tail stock

v. Cross slide

d) List down the various operations that can be carried out on a lathe

e) Write a short note on the materials used for cutting tools

12. Answer the following:

(10+10+05)

a) A bar ABCD consists of three cylindrical steel segments, each having a different cross sectional area and loaded as shown in Fig: 1. Calculate the normal stresses in each segment and the total elongation of the bar if $E = 200 \text{ GPa}$. The areas of various portions of the bar are shown in Fig: 1

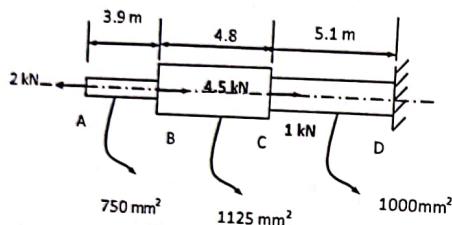


Fig: 1

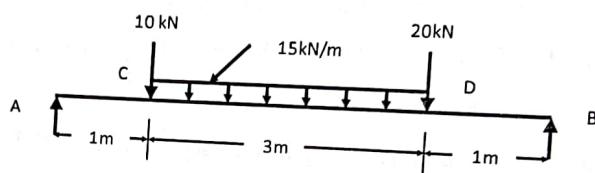


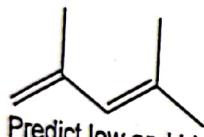
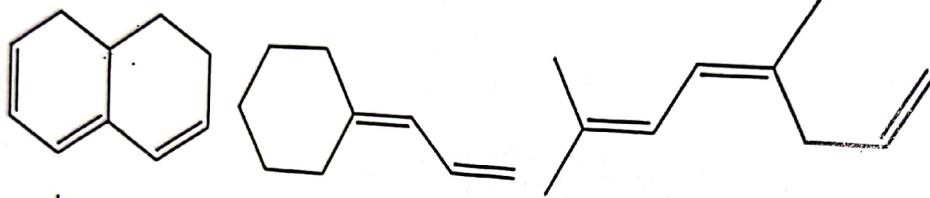
Fig: 2

- b) Draw the shear force and bending moment diagram for the loaded beam shown in Fig: 2. Show all the relevant calculations supporting your diagram. Does the beam possess point of contra flexure? Justify your answer.
- c) Give a detailed classification of welding processes used in engineering industry. Discuss the various types of weld defects that you may encounter in a welded connection.

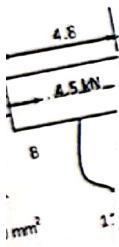
1. Answer all the questions
2. Answer for sub questions has to be labeled properly
3. Find reduction potential data as an annexure

1. Given the following equation for an electrochemical cell reaction 6 Marks
 $H_2(g) + PbSO_4(s) \rightleftharpoons 2H^+(aq) + SO_4^{2-}(aq) + Pb(s)$
 Predict the effect of the following changes on the observed cell voltage:
 (a) increase in size of Pb(s) electrode
 (b) decrease in pH of cell electrolyte
 (c) dilution of cell electrolyte with water
 (d) dissolution of a small amount of NaOH(s) in the cell electrolyte
2. The measured voltage at 25°C of a cell in which the reaction described by 4 Marks
 the equation
 $Co(s) + Sn^{2+}(aq, 0.18 M) \rightleftharpoons Sn(s) + Co^{2+}(aq, 0.020 M)$
 takes place at the concentrations shown is 0.168 V. Calculate the values
 of E°_{cell} and the equilibrium constant (K), for the cell equation.
3. The measured voltage of the cell described by 4 Marks
 $Pt(s)|H_2(g, 1.00 \text{ bar})|H^+(aq)||Ag^+(aq, 0.80 M)|Ag(s)$
 is 0.915 V at 25°C. What would be the pH of the solution for this
 condition?
4. Beryllium occurs naturally in the form of beryl. The metal is produced from 3 Marks
 its ore by electrolysis after the ore has been converted to its oxide and
 then to the chloride. Calculate the maximum amount of Be(s) that can be
 deposited from a $BeCl_2(l)$ melt by a current of 5.0 amperes that flows for
 1.0 hour.
5. An oxide cell, involving a $Ag_2O(s)|Ag(s)$ cathode is used to power a 4 Marks
 wristwatch. The cell is estimated to last 1000 hours while drawing a
 current of only 0.10 mA. Calculate the mass of silver metal that will be
 produced over the lifetime of the cell.
6. For the cell 5 Marks
 $Ag(s)|Br^-(aq)|AgBr(s)||Ag^+(aq)|Ag(s)$
 write the cell equation and determine the solubility product constant of
 $AgBr(s)$ in water at 25°C.
7. Two electrolytic cells are connected in series. One cell contains a solution 4 Marks
 of $AgClO_4(aq)$ and the other cell contains a solution of $Cd(ClO_4)_2(aq)$. An
 electric current is passed through the two cells until 0.876 grams of Ag(s)
 is deposited. How many grams of Cd(s) will be deposited in the same
 time?
8. Using the data in appendix, determine the standard reduction potential at 4 Marks
 25°C for the half-reaction equation
 $Ti^{4+}(aq) + 4e^- \rightarrow Ti(s)$
9. Describe cold soda lime process with proper diagram and chemical 5 Marks
 equations

- 5 Marks
- 3 Marks
- 8 Marks
- 5 Marks
- 5 Marks
- 8 Marks
- 6 Marks
- 3 Marks
- 5 Marks
- 6 Marks
- 7 Marks
10. Describe zeolite process for water treatment with proper diagram and chemical equations.
11. 6 ml of wastewater is diluted to 300 ml distilled water in standard BOD bottle. Initial DO in the bottle is determined to be 8.5 mg/l. DO after 5 days is found to be 5 mg/l. Determine BOD of wastewater
12. write the electron pair and predict the molecular structure of each of the following molecules or ions: (a) IF_3 , (b) ClO_3^- , (c) I_3^- , (d) XeO_4^-
13. Draw the molecular orbital diagram for NO molecule and calculate the bond order and predict the magnetic property
14. Draw the relative energy level diagram of d orbitals in case of octahedral and tetragonally distorted octahedral complexes due to Jahn Teller distortion.
15. Predict the λ_{max} for the following molecules
16. Predict low and high resolution NMR for following molecules
17. Predict the intensity ratio of EPR transition for an hypothetical molecule bearing one unpaired electron and 6 equivalent nuclei having $I=1/2$ each
18. A solution containing 5.24 mg/100 mL of compound A (MW: 335 g/mol) has a transmittance of 55.2% in a 1.50 cm cell at 425 nm. Calculate the molar absorptivity (ϵ) of compound A at this wavelength.
19. Describe the synthesis, properties and application of TEFLO
20. Write the free radical mechanism for the addition polymerization of

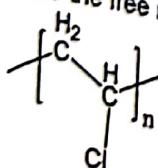


rock
slide
; various op
t note on the
lowing:
CD consists
loaded as s
of the bar



Draw the s
all the re
flexure? J
Give a
various 1

****ALL THE BEST****



$\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag}$	+0.80	$\text{In}^{2+} + \text{e}^- \rightarrow \text{In}^+$	-0.49
$\text{Ag}^{2+} + \text{e}^- \rightarrow \text{Ag}^+$	+1.98	$\text{In}^{3+} + \text{e}^- \rightarrow \text{In}^{2+}$	-0.44
$\text{AgBr} + \text{e}^- \rightarrow \text{Ag} + \text{Br}^-$	+0.07	$\text{In}^{3+} + 2 \text{e}^- \rightarrow \text{In}^+$	-0.34
$\text{AgCl} + \text{e}^- \rightarrow \text{Ag} + \text{Cl}^-$	+0.22	$\text{In}^{3+} + 3 \text{e}^- \rightarrow \text{In}$	-2.93
$\text{AgF} + \text{e}^- \rightarrow \text{Ag} + \text{F}^-$	+0.78	$\text{K}^+ + \text{e}^- \rightarrow \text{K}$	-2.52
$\text{AgI} + \text{e}^- \rightarrow \text{Ag} + \text{I}^-$	-0.15	$\text{La}^{3+} + 3 \text{e}^- \rightarrow \text{La}$	-3.05
$\text{Al}^{3+} + 3 \text{e}^- \rightarrow \text{Al}$	-1.66	$\text{Li}^+ + \text{e}^- \rightarrow \text{Li}$	-2.36
$\text{Au}^+ + \text{e}^- \rightarrow \text{Au}$	+1.69	$\text{Mg}^{2+} + 2 \text{e}^- \rightarrow \text{Mg}$	-1.18
$\text{Au}^{3+} + 3 \text{e}^- \rightarrow \text{Au}$	+1.40	$\text{Mn}^{2+} + 2 \text{e}^- \rightarrow \text{Mn}$	+1.51
$\text{Ba}^{2+} + 2 \text{e}^- \rightarrow \text{Ba}$	-2.91	$\text{Mn}^{3+} + \text{e}^- \rightarrow \text{Mn}^{2+}$	+1.23
$\text{Be}^{2+} + 2 \text{e}^- \rightarrow \text{Be}$	-1.85	$\text{MnO}_2 + 4 \text{H}^+ + 2 \text{e}^- \rightarrow \text{Mn}^{2+} + 2 \text{H}_2\text{O}$	+0.56
$\text{Bi}^{3+} + 3 \text{e}^- \rightarrow \text{Bi}$	+1.09	$\text{MnO}_4^- + \text{e}^- \rightarrow \text{MnO}_4^{2-}$	+1.51
$\text{Br}_2 + 2 \text{e}^- \rightarrow 2 \text{Br}^-$	+0.76	$\text{MnO}_4^- + 8 \text{H}^+ + 5 \text{e}^- \rightarrow \text{Mn}^{2+} + 4 \text{H}_2\text{O}$	+0.60
$\text{BrO}^- + \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{Br}^- + 2 \text{OH}^-$	-2.87	$\text{MnO}_4^{2-} + 2 \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{MnO}_2 + 4 \text{OH}^-$	+0.80
$\text{Ca}^{2+} + 2 \text{e}^- \rightarrow \text{Ca}$	-0.40	$\text{NO}_3^- + 2 \text{H}^+ + \text{e}^- \rightarrow \text{NO}_2 + \text{H}_2\text{O}$	+0.96
$\text{Cd}^{2+} + 2 \text{e}^- \rightarrow \text{Cd}$	-0.81	$\text{NO}_3^- + 4 \text{H}^+ + 3 \text{e}^- \rightarrow \text{NO} + 2 \text{H}_2\text{O}$	+0.01
$\text{Cd(OH)}_2 + 2 \text{e}^- \rightarrow \text{Cd} + 2 \text{OH}^-$	-2.48	$\text{NO}_3^- + \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{NO}_2^- + 2 \text{OH}^-$	-2.71
$\text{Ce}^{3+} + 3 \text{e}^- \rightarrow \text{Ce}$	+1.61	$\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$	-0.23
$\text{Ce}^{4+} + \text{e}^- \rightarrow \text{Ce}^{3+}$	+1.36	$\text{Ni}^{2+} + 2 \text{e}^- \rightarrow \text{Ni}$	+0.49
$\text{Cl}_2 + 2 \text{e}^- \rightarrow 2 \text{Cl}^-$	+0.89	$\text{Ni(OH)}_3 + \text{e}^- \rightarrow \text{Ni(OH)}_2 + \text{OH}^-$	-0.56
$\text{ClO}^- + \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{Cl}^- + 2 \text{OH}^-$	+1.23	$\text{O}_2 + \text{e}^- \rightarrow \text{O}_2^-$	+1.23
$\text{ClO}_4^- + 2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{ClO}_3^- + \text{H}_2\text{O}$	+0.36	$\text{O}_2 + 4 \text{H}^+ + 4 \text{e}^- \rightarrow 2 \text{H}_2\text{O}$	-0.08
$\text{ClO}_4^- + \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{ClO}_3^- + 2 \text{OH}^-$	-0.28	$\text{O}_2 + \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{HO}_2^- + \text{OH}^-$	+0.40
$\text{Co}^{2+} + 2 \text{e}^- \rightarrow \text{Co}$	+1.81	$\text{O}_2 + 2 \text{H}_2\text{O} + 4 \text{e}^- \rightarrow 4 \text{OH}^-$	+2.07
$\text{Co}^{3+} + \text{e}^- \rightarrow \text{Co}^{2+}$	-0.91	$\text{O}_3 + 2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{O}_2 + \text{H}_2\text{O}$	+1.24
$\text{Cr}^{2+} + 2 \text{e}^- \rightarrow \text{Cr}$	+1.33	$\text{O}_3 + \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{O}_2 + 2 \text{OH}^-$	-0.13
$\text{Cr}_2\text{O}_7^{2-} + 14 \text{H}^+ + 6 \text{e}^- \rightarrow 2 \text{Cr}^{3+} + 7 \text{H}_2\text{O}$	-0.74	$\text{Pb}^{2+} + 2 \text{e}^- \rightarrow \text{Pb}$	+1.67
$\text{Cr}^{3+} + 3 \text{e}^- \rightarrow \text{Cr}$	-0.41	$\text{Pb}^{4+} + 2 \text{e}^- \rightarrow \text{Pb}^{2+}$	-0.36
$\text{Cr}^{3+} + \text{e}^- \rightarrow \text{Cr}^{2+}$	-2.92	$\text{PbSO}_4 + 2 \text{e}^- \rightarrow \text{Pb} + \text{SO}_4^{2-}$	+1.20
$\text{Cs}^+ + \text{e}^- \rightarrow \text{Cs}$	+0.52	$\text{Pt}^{2+} + 2 \text{e}^- \rightarrow \text{Pt}$	+0.97
$\text{Cu}^+ + \text{e}^- \rightarrow \text{Cu}$	+0.34	$\text{Pu}^{4+} + \text{e}^- \rightarrow \text{Pu}^{3+}$	-2.92
$\text{Cu}^{2+} + 2 \text{e}^- \rightarrow \text{Cu}$	+0.15	$\text{Ra}^{2+} + 2 \text{e}^- \rightarrow \text{Ra}$	-2.93
$\text{Cu}^{2+} + \text{e}^- \rightarrow \text{Cu}^+$	+2.87	$\text{Rb}^+ + \text{e}^- \rightarrow \text{Rb}$	-0.48
$\text{F}_2 + 2 \text{e}^- \rightarrow 2 \text{F}^-$	-0.44	$\text{S} + 2 \text{e}^- \rightarrow \text{S}^{2-}$	+0.17
$\text{Fe}^{2+} + 2 \text{e}^- \rightarrow \text{Fe}$	-0.04	$\text{SO}_4^{2-} + 4 \text{H}^+ + 2 \text{e}^- \rightarrow \text{H}_2\text{SO}_3 + \text{H}_2\text{O}$	+2.05
$\text{Fe}^{3+} + 3 \text{e}^- \rightarrow \text{Fe}$	+0.77	$\text{S}_2\text{O}_8^{2-} + 2 \text{e}^- \rightarrow 2 \text{SO}_4^{2-}$	-0.67
$\text{Fe}^{2+} + \text{e}^- \rightarrow \text{Fe}^{2+}$	-0.53	$\text{Se} + 2 \text{e}^- \rightarrow \text{Se}^{2-}$	-0.14
$\text{Ga}^+ + \text{e}^- \rightarrow \text{Ga}$	0, by definition	$\text{Sn}^{2+} + 2 \text{e}^- \rightarrow \text{Sn}$	+0.15
$2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{H}_2$	+1.60	$\text{Sn}^{4+} + 2 \text{e}^- \rightarrow \text{Sn}^{2+}$	-2.89
$2 \text{HBrO} + 2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{Br}_2 + 2 \text{H}_2\text{O}$	+1.63	$\text{Sr}^{2+} + 2 \text{e}^- \rightarrow \text{Sr}$	-0.84
$2 \text{HClO} + 2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{Cl}_2 + 2 \text{H}_2\text{O}$	-0.83	$\text{Te} + 2 \text{e}^- \rightarrow \text{Te}^{2-}$	-1.63
$2 \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{H}_2 + 2 \text{OH}^-$	+1.78	$\text{Ti}^{2+} + 2 \text{e}^- \rightarrow \text{Ti}$	-0.37
$\text{H}_2\text{O}_2 + 2 \text{H}^+ + 2 \text{e}^- \rightarrow 2 \text{H}_2\text{O}$	+3.0	$\text{Ti}^{3+} + \text{e}^- \rightarrow \text{Ti}^{2+}$	0.00
$\text{H}_4\text{XeO}_6 + 2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{XeO}_3 + 3 \text{H}_2\text{O}$	+0.79	$\text{Ti}^{4+} + \text{e}^- \rightarrow \text{Ti}^{3+}$	-0.34
$\text{Hg}_{2+}^{2+} + 2 \text{e}^- \rightarrow \text{Hg}$	+0.85	$\text{Ti}^+ + \text{e}^- \rightarrow \text{Ti}$	-1.79
$\text{Hg}_{\frac{5}{2}}^{3+} + 2 \text{e}^- \rightarrow \text{Hg}$	+0.92	$\text{U}^{3+} + 3 \text{e}^- \rightarrow \text{U}$	-0.61
$2 \text{Hg}^{2+} + 2 \text{e}^- \rightarrow \text{Hg}_2^{2+}$	+0.27	$\text{U}^{4+} + \text{e}^- \rightarrow \text{U}^{3+}$	-1.19
$\text{Hg}_2\text{Cl}_2 + 2 \text{e}^- \rightarrow 2 \text{Hg} + 2 \text{Cl}^-$	+0.54	$\text{V}^{2+} + 2 \text{e}^- \rightarrow \text{V}$	-0.26
$\text{I}_2 + 2 \text{e}^- \rightarrow 2 \text{I}^-$	+0.53	$\text{V}^{3+} + \text{e}^- \rightarrow \text{V}^{2+}$	-0.76
$\text{I}_3^- + 2 \text{e}^- \rightarrow 3 \text{I}^-$	-0.14	$\text{Zn}^{2+} + 2 \text{e}^- \rightarrow \text{Zn}$	
$\text{In}^+ + \text{e}^- \rightarrow \text{In}$			

Section : A

Section 'A'

1st yr

1st Sem

Roll No. _____



National Institute of Technology Goa

Programme Name: B.Tech
End Semester Examinations, November 2018

Course Name: Mathematics-I
Date: 26/11/2018
Duration: 3 Hours

Course Code: MA100
Time: 09:30 AM - 12:30 PM
Max. Marks: 100

1. Answer All Questions.
2. No marks will be given if the explanation of your answer is missing.
3. The question paper consists of two pages.

Part A (12 × 5 = 60)

1. If $y_1 = \frac{x_2 x_3}{x_1}$, $y_2 = \frac{x_3 x_1}{x_2}$, $y_3 = \frac{x_1 x_2}{x_3}$. Then find Jacobian of y_1, y_2, y_3 with respect to x_1, x_2, x_3 .
2. Suppose $w = f(u) + g(v)$ where $u = x + iy$ and $v = x - iy$ and $i = \sqrt{-1}$. Show that w satisfies the Laplace equation $w_{xx} + w_{yy} = 0$ if all the necessary functions are differentiable.
3. Find cubic approximation of $\cos(x^2 + y^2)$ at origin.
4. If $f(x, y) = 100(y + 1)$ represents the population density of a planar region on Earth, where x and y are measured in miles, find the number of people in the region bounded by the curves $x = y^2$ and $x = 2y - y^2$.
5. Evaluate $\iint_R \frac{\ln(x^2 + y^2)}{x^2 + y^2} dx dy$ over the region $R : 1 \leq x^2 + y^2 \leq e^2$.
6. Find the mass of a solid cube in the first octant is bounded by the coordinate planes and by the planes $x = 1$, $y = 1$ and $z = 1$ where the density of the cube is $\delta(x, y, z) = x + y + z + 1$.
7. Find the volume of the "ice cream cone" D cut from the solid sphere $\rho \leq 1$ by the cone $\phi = \frac{\pi}{3}$.
8. Convert the integral $\int_{-1}^1 \int_0^{\sqrt{1-y^2}} \int_0^x (x^2 + y^2) dz dx dy$ to an equivalent integral in cylindrical coordinates and evaluate it.
9. If \vec{a} and \vec{b} be constant vectors then show that $\nabla[\vec{r} \cdot \vec{a} \cdot \vec{b}] = \vec{a} \times \vec{b}$ where \vec{r} is the position vector.
10. For what values of b and c vector field $\vec{F} = (y^2 + 2cz)i + y(bx + cz)j + (y^2 + cx^2)k$ be a gradient field? Use the result in \vec{F} to find its velocity potential ϕ .

11. Find the work done by the force field $F = (y - x^2)i + (z - y^2)j + (x - z^2)k$ along the curve $r(t) = ti + t^2j + t^3k$, $0 \leq t \leq 1$, from $(0, 0, 0)$ to $(1, 1, 1)$.

12. Find Fourier cosine series of $f(t) = \begin{cases} kx, & 0 \leq x \leq \frac{l}{2}, \\ k(l-x), & \frac{l}{2} \leq x \leq l. \end{cases}$

Part B ($4 \times 10 = 40$)

1. Find a Fourier series to represent $x - x^2$ from $-\pi$ to π and hence deduce the following relation:

$$\frac{\pi^2}{12} = 1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$$

2. (a) Use Green's theorem to find the counterclockwise circulation for the field $F = (y^2 - x^2)i + (x^2 + y^2)j$ where curve C is triangle bounded by $y = 0$, $x = 3$ and $y = x$.
 (b) Use the Divergence theorem to find the outward flux of $F = x^2i + xzj + 3zk$ across the boundary of the region D where D is the solid sphere $x^2 + y^2 + z^2 \leq 4$.
3. (a) Assume that volume of the parallelopiped is $8xyz$ where (x, y, z) denotes the coordinate axes. Then find the volume of largest parallelopiped that can be inscribed in the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$.
 (b) Your firm has been asked to design a storage tank for liquid petroleum gas. The customer's specifications call for a cylindrical tank with hemispherical ends, and the tank is to hold $8000m^3$ of gas. The customer also wants to use the smallest amount of material possible in building the tank. What radius and height do you recommend for the cylindrical portion of the tank?
4. (a) Assume a sequence $2, 2 + \frac{1}{2}, 2 + \frac{1}{2 + \frac{1}{2}}, 2 + \frac{1}{2 + \frac{1}{2 + \frac{1}{2}}}, \dots$ converges then find its limit.
 (b) Verify the infinite series $\sum_{n=1}^{\infty} \frac{(n+1)(n+2)}{n!}$ converges or diverges.

Section : A

Section A

Roll No									
---------	--	--	--	--	--	--	--	--	--



NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

Programme Name: B.Tech.

1st yr

1st Sem

End Semester Examinations, November-2018

Course Name:

Date: 27/11/2018

Duration: 3.0 Hours

Engineering Mechanics

Course Code: ME 100

Time: 9.30am to 12.30pm

Max. Marks: 100

ANSWER ALL QUESTIONS

- Q. No. 1**
- (a) What do you mean by (i) equivalent force system? **02**
(ii) simplest resultant of force system **02**
- (b) Force system at the pin joint of a truss is shown in Fig Q. No. 1(b). Determine the total force in x and y direction. **06**
- (c) Find the resultant of the force system shown in Fig Q. No. 1(c) at point A **10**

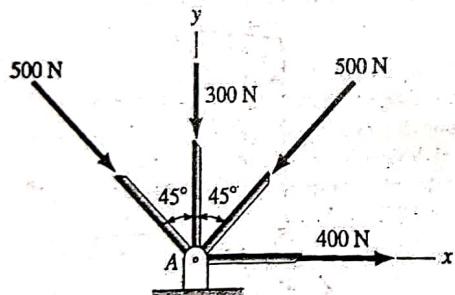


Fig. Q. No. 1(b)

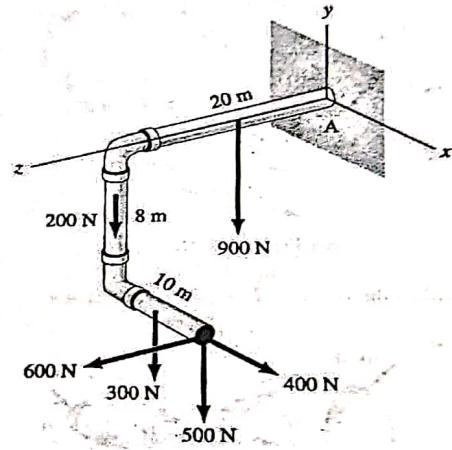


Fig. Q. No. 1(c)

- Q. No. 2**
- (a) For the beam AB shown in the Fig. Q. No. 2(a), find out the degree of indeterminacy. **10**
Support A is hinged and support B is roller support. Also, compute the reactions at the supports A and B.
- (b) Find the centroid of the lamina shown in Fig. Q. No. 2(b). **10**

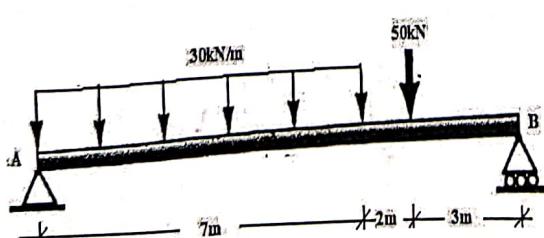


Fig. Q. No. 2(a)

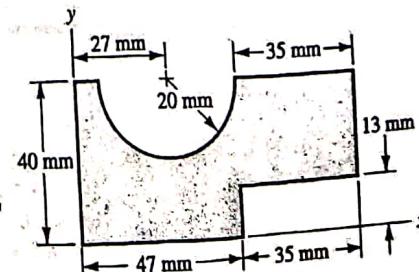


Fig. Q. No. 2(b)

12

A stunt motorcyclist is required to jump over deep gorge 60m wide as shown in the Fig. Q. No. 3. At what speed he should ride a bike from the jump-off point?

Q.
No. 3

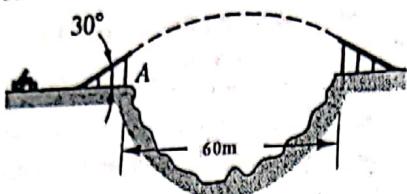


Fig. Q. No. 3

Q.
No. 4

A body weighing 100N, as shown in Fig. Q. No. 4, is sliding on an incline of 50° , starting from rest. What distance along the incline the body must travel to reach the velocity of 20m/sec? Take the coefficient of dynamic friction between the body and the incline as 0.45.

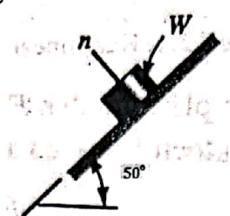


Fig. Q. No. 4

Q.
No. 5

(a) Starting from the expression for moment of momentum for the body shown in Fig. Q. No. 5(a), $dH_a = \rho x (\omega x \rho) dm$, derive the expression for H_a .

(b) A uniform rod of length $L = 2.5\text{m}$ long and weighing 100N is shown in Fig Q. No. 5(b). The rod is supported on pin at A and wire at B. Determine the force on the pin at the instant the wire is released.

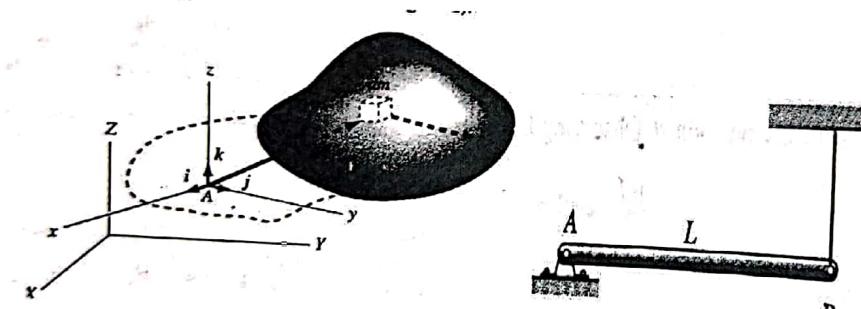


Fig. Q. No. 5(a)

Fig. Q. No. 5(b)

Q.
No. 6

(a) Three coupled street cars each weighing 200kN are moving at the speed of 10m/sec down an incline of 10° (Fig. Q. No. 6(a)). A per customer specifications, car is required to stop at a distance of 50m from the point of application of brakes. Assuming 24 brakes (one per each wheel), find out how many brake failures can be tolerated? Take $\mu_d = 0.50$.

(b) A cannon with recoil as shown in Fig. Q. No. 6(b), weighing 12kN fires a projectile weighing 50N at the muzzle velocity of 0.65km/sec at an angle of 40° . Determine the maximum compression of the spring if $K = 5\text{kN/m}$.



Fig. Q. No. 6(a)

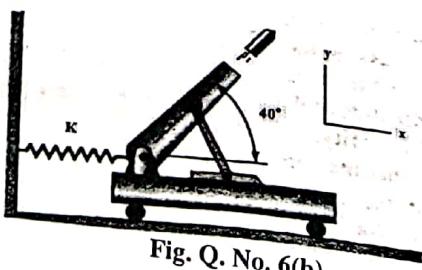


Fig. Q. No. 6(b)

ANSWER ALL QUESTIONS

- 1a. What are the different data types in C Programming? Explain. Also give the details of the different control strings used for each data type.
- 1b. Write a program to compute all the prime numbers between two user given numbers.
[Hint: Prime numbers between 5 to 25]
- 1c. Explain the different parameter passing techniques with necessary example. (8+6+6)
- 2a. What is an array data type? Explain. Discuss the different ways to initialize & read the two dimensional arrays with necessary example.
- 2b. Write a program to check whether the given string is a palindrome or not. Use user defined function. [Hint don't use built in string handling functions]
- 2c. Explain the general structure of the following control Structures:
i. Uni-directional Control Statement
ii. Bi-directional Control Statement
iii. Multi-directional Control Statement. (7+6+7)
- 3a. Write a program to sum the cosine series upto the term accuracy is 0.0001. Use while loop do the necessary computation.
[Hint: $\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$]
- 3b. How union data type is different from structure data type? Explain with necessary general form. Also explain how to initialize the members of each data type.
- 3c. Write a program to convert given decimal number into its equivalent octal number. Use switch statement. (6+7+7)
- 4a. What is recursive function? Give the general form of recurve function. Also, write a program segment to compute the factorial of a number using recursive program construct.
- 4b. Consider a situation that a class of n students takes an annual examination in m subjects. Write a program to read the marks obtained by each student in various subjects and compute and print the total marks obtained by each of them.
- 4c. Explain the ternary operator with necessary general syntax. Also write a program to compute whether a given number is odd or even. (7+8+5)

- 5a. Write the output for the following program segments:

```
main ( )  
{  
    char string[] = "WEL COME"  
    int m;  
    for (m = 0; string [m] != '\0'; m++)  
        if (m%2 == 0)  
            printf ("% c", string[m]);  
}
```

Fig 5a-i

Page 1 of 2

```
#include <stdio.h>  
int main ( ) {  
    int i;  
    for (i = 0; i<= 4; i++)  
        printf ("% d", i)  
    return 0;  
}
```

Fig 5a-ii

```
void test();
main ()
{ test();
  test();
  test();
}
void test()
{
  static int a = 0;
  a = a+1;
  printf("%d",a);
}
```

Fig 5a-iii

```
main()
{ int *px, *py;
static int a[6] = {1, 2, 3, 4, 5, 6};
px = &a[0];
py = &a[5];
printf("px = %x py = %x", px, py);
printf("\n py - px = %x", py-px);
}
```

Fig 5a-iv

5b. Explain the different looping statements with necessary general syntax.

(12+8)

-----ALL THE BEST-----

Section : A

Roll No	1	8	E	E	E	1	0	8
---------	---	---	---	---	---	---	---	---



राष्ट्रीय प्रौद्योगिकी संस्थान गोवा

Section : A

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

1st yr1st Sem

Programme Name: B.Tech.

End Semester Examinations, November-2018

Course Code and Name: ME101- Engineering Drawing

Semester: I

Date: 29.11.2018

Time: 10am- 1pm

Duration: 3 Hours

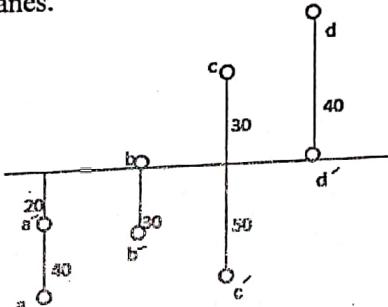
Max. Marks: 100

Please read the following instructions before solving:

1. Retain Construction lines 2. Line work and neatness carries weightage 3. Assume missing data if any

ANSWER ALL QUESTIONS

- Q1. a) How will you designate your drawing sheets and also, specify the designation of drawing sheet that you are using. b) For lettering height of character h = 5mm, what is the spacing between the words? c) Figure below shows the projections of different points. Determine the position of the points with reference to the projection planes. (1+1+4= 6M)



- Q2. a) Show by means of traces, each of the following lines (i) perpendicular to the HP and the VP (ii) perpendicular to the HP and inclined at 30° to the VP (iii) parallel to and 40mm behind the VP (iv) parallel to the HP and 40mm below it

- b) Line CD 20mm in front of VP and makes 45° with the HP; the end D is 30mm in front of LPP. Draw its projections on all reference planes. (4+8= 12M)

- Q3. A line AB of length 65mm is inclined at 40° to HP and 30° to VP. The end A is 25mm above HP and 30mm in front of VP. Draw the projections of the line and locate its traces. (12M)

- Q4. A kite has diagonals 40cm and 25cm length. The diagonal intersect at a point 15cm from an end of the major diagonal. The kite rests on the ground on one its longer edges. The plane of the kite makes 60° with the ground while the edge on the ground makes 30° with the vertical wall. Draw the projections of the kite. (8M)

- Q5. A 60° set-square of 125mm longest side is so kept that the longest side is in HP, making an angle of 30° with the VP and the set-square itself inclined at 45° to the HP. Draw the projections of the set square. (12M)

(PTO)

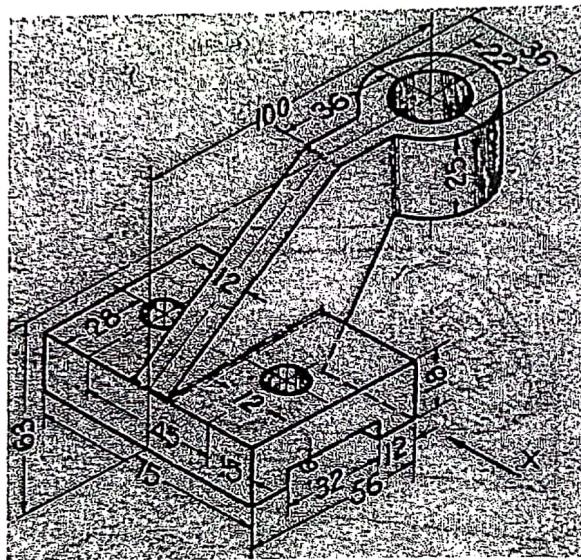
$$\frac{3h}{10} = \frac{753}{100} : 1.5$$

6. A cone of base diameter 30mm and axis 70mm long has one its generators on VP. Draw its projections when the axis is parallel to HP. (8M)

A hexagonal prism of 30mm base edges and axis 70mm long is resting on one of its base corners on HP and the lateral edge through that corner is inclined at 30° to HP. Draw the projections when the vertical plane through the axis makes an angle of 60° with the VP. (12M)

8. Draw the section front view and true shape of the section of a pentagonal pyramid base 30mm and axis rest its base on the HP such that the edges of its base is parallel to VP. The section plane inclined at 45° to the VP and perpendicular to the HP passing through the pyramid at a distance 10mm from its axis. (10M)

9. Figure below shows an object in a pictorial view. Draw front view looking in direction of X, top and left side view of the object with dimensions. (12M)



Roll no						
---------	--	--	--	--	--	--



NATIONAL INSTITUTE OF TECHNOLOGY GOA

Programme Name: B.Tech

End Semester Examination, November-2018

1st yr

1st Sem

Course Name: Physics

Date: 30.11.2018

Duration: 3 Hours

Course Code: PH100

Time: 9.30 AM

Max. Marks: 100

ANSWER ALL QUESTIONS

1. a) The ratio $\frac{n_i}{g_i}$ of the number n_i of particles with a given energy ε_i to the number g_i of quantum states having energy ε_i is given by (8M)

$$f_{FD}(\varepsilon_i, T) = \frac{n_i}{g_i} = \frac{1}{\exp\left(\frac{\varepsilon_i - \varepsilon_F}{kT}\right) + 1} \text{ in the case of Fermi-Dirac statistics,}$$

$$f_{BE}(\varepsilon_i, T) = \frac{n_i}{g_i} = \frac{1}{\exp\left(\frac{\varepsilon_i - \varepsilon_F}{kT}\right) - 1} \text{ in the case of Bose-Einstein statistics,}$$

$$f_{MB}(\varepsilon_i, T) = \frac{n_i}{g_i} = \exp\left\{-\frac{\varepsilon_i - \varepsilon_F}{kT}\right\} \text{ in the case of Maxwell-Boltzmann statistics,}$$

(i) Under which conditions does this ratio become the same for all three cases?

(ii) Determine $\frac{n_i}{g_i}$ for the special case for $\varepsilon_i = \varepsilon_F$

(iii) For the two temperatures $T = 10^{-3} K$ and $T = 300 K$ plot $\frac{n_i}{g_i}$ as a function of ε_i in the range $-0.1 eV \leq \varepsilon_i - \varepsilon_F \leq 0.1 eV$ and describe what happens at very low temperatures.

b) Write the most probable microstate for Bose-Einstein statistics and derive the Bose-Einstein distribution in the form of $f(E)_{BE} = \frac{1}{e^{\alpha + \beta E} - 1}$ for a system of indistinguishable Bosons. (6M)

c) Find the temperature at which there is 1% Probability that a state with energy 2eV is occupied. Given that Fermi energy is 1.5 eV. (4M)

2. a) Derive the form of the Plank radiation formula in the limit case:

$$(i) \frac{hc}{\lambda k_B T} \ll 1 \text{ (Large Wavelengths)}$$

$$(ii) \frac{hc}{\lambda k_B T} \gg 1 \text{ (Small Wavelengths). Interpret the results} \quad (4M)$$

b) From a sodium surface, light of wavelength 3125 Å and 3650 Å causes emission of electrons whose maximum kinetic energy is 2.128 eV and 1.595 eV, respectively. Estimate Plank's constant and work function of sodium. (4M)

c) The temperature of your skin is approximately 35 °C. What is the wavelength at which the peak occurs in the radiation emitted from your skin? (4M)

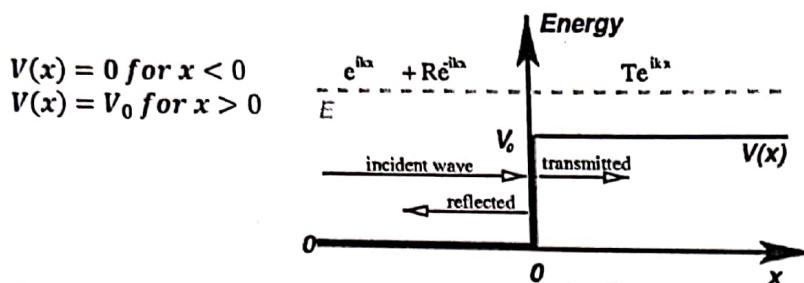
d) What is Compton effect? Show that the change in wavelength of the photon is given by $\Delta\lambda = \frac{h}{m_0 c} (1 - \cos\theta)$ (6M)

e) An electron has a speed of 500 m/s with an accuracy of 0.004%. Calculate the certainty with which we can locate the position of the electron. (Electron Mass $9.11 \times 10^{-31} kg$) (4M)

3. a) What is an infinite potential well? Obtain Schrodinger's time independent wave equation. Solve it for particles in a one dimensional cubical box of a side 'a', and hence obtain expressions for the allowed wave functions and discrete energy values of the particle. (4M)

- b) The normalized wave function for certain particle is $\Psi(x) = \sqrt{\frac{3}{\pi}} \cos x, -\frac{\pi}{2} < x < \frac{\pi}{2}$. Calculate the probability of finding the particle between $0 < x < \frac{\pi}{4}$ (4M)

- c) A particle of total energy E is moving in a one dimensional potential is given by



Calculate the reflection and transmission coefficients for the case $E > V_0$ (6M)

- d) If a beam of electrons impinges on any energy barrier of height 0.25 eV and of infinite width, find the fraction of electrons reflected and transmitted at the barrier if the energy of impinging electrons: (i) 0.30 eV (ii) 0.20 eV and (iii) 0.25 eV (4M)

4. a) Explain three level and four level laser systems. What are the advantages of four level laser system over three level and two level laser systems. (4M)
 b) Show that the probabilities for stimulated emission and for spontaneous emission are proportional. (4M)
 c) Find the ratio of populations of two states in He-Ne laser that produces light of wavelength 6328 Å and 27 °C. (Given Boltzmann constant: $1.38 \times 10^{-23} J/Kelvin$ and Planks constant: $6.63 \times 10^{-34} Js$) (3M)
 d) A He-Ne laser is emitting a beam with an average power of 4.5 mW. Find the number of photons emitted per second by the laser. The wavelength of the emitted radiation is 6328 Å. (3M)
5. a) Explain the different types of optical fibers, along with the refractive index profile and mode propagation sketches. (4M)
 b) A glass clad fiber is made with core glass of refractive index 1.5 and the cladding is doped to give a fractional index difference of 0.0005. Find (i) the cladding index, (ii) the critical internal reflection angle. (4M)
 c) An optical fiber is 2m long and has a diameter of 20 μm. if a ray of light is incident on one end of the fiber at an angle of 40°, how many reflections does it undergo before emerging from the other end? (4M)
 Refractive index of fiber is 1.3.
6. a) Compare the dependence of resistance on temperature of a superconductor with that of normal conductor. (4M)
 b) Calculate the critical current for a wire of lead having a diameter of 1mm at 4.2 K. The critical temperature for lead is 7.18 K and $H_c(0) = 6.5 \times 10^4 A/m$. (4M)
 c) For an efficient water heating system which works on solar energy,
 (i) What are the desirable material properties of the absorber plate? (4M)
 (ii) What constructional features helps to reduce conduction
 (iii) How to position the absorber plate



Section : A

Roll No									
---------	--	--	--	--	--	--	--	--	--

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

1st yr

Programme Name: B.Tech

1st Sem

End Semester Examination, Nov-2018

Course Name: Professional Communication-I

Duration: 3 hrs

Course code: HU 100

Time: 9:30 p.m. – 12:30 p.m.

Date: 1/12/2018

Max. Marks: 100

ANSWER ALL QUESTIONS

Instructions:

- Kindly don't break the sequence of the Questions
- Do not write answer of the same question in parts at different places

Q.1 What do you understand by Communication Network? What are the different types? Enumerate the merits and demerits of different types on communication. (10M)

Q. 2. Compare and contrast Verbal and Non-Verbal Communication with relevant examples. (15M)

Q.3. Punctuate the following sentences and capitalize wherever necessary: (5M)

- a like sharda vidyapith high school its teachers are very inspiring and motivating
- b. arjun and mala visited big foot museum for just one reason to go to the Art Fair
- c. my english teacher is so strict at the beginning of the quarter she said If you miss three classes you will get an F
- d. the movies nominated for the 1994 Movie of the Year Award are The Piano Jurassic Park and schindler's list
- e. it was a cold day i had to wrap up warmly

Q.4. Make meaningful sentences with the following group verbs: (6M)

a. Make out, b. Call for, c. Put out, d. Get away, e. Run out, f. Make room for

Q. 5. Write a Précis of following passage and add a suitable title to it. (4M+1M)

Read the passage and write a precis of it and add a suitable title to it.

Part of the problem lies with the attitude and mentality of the driver behind the steering wheel. The car is a personal vehicle and one possesses the freedom to drive it independently and at one's own will. But one must understand that the road on which one drives is open to the public. This blurring of the dichotomy between the public and the private leads to reckless behaviour on the roads. Respect for the elderly and pedestrians, so common in countries abroad, is a thing of rarity to be found in our land. A little consideration to road rules and adoption of simple safety measures such as fastening of the seat belt, can go a long way in reducing this menace.

Q. 6. Promote South Goa as a Tourist Destination for the Russians. (8M)

Q. 7. Assume that you are the Class Representative of BBA batch of Goa University. You have received a request from your batch mates that the library should remain open at night as well as on weekends. Write a memo for implementation of the same. Invent the necessary details. (6M)

Q. 8. Write a Paragraph on Four things that you wish to change in the state of Goa and Why (8M)

Q. 9. Body found in a sewage pipe (8M)
Invent the necessary details and write a journalistic report.

Q. 10. Assume that you are the Head, Production unit of Rainbow Garments. Your company plans to open an outlet in Ponda. Write a feasibility report of this project to your CEO. (10M)

Q. 11. As a representative of the final year students of your batch, you attended the 4th meeting of the Mess Committee and the issues discussed were: Bad Quality Food, Delay in service and the unhygienic condition. Prepare the minutes of it and invent the necessary details. (8M)

Q. 12. Imagine, you are the MD of Fortis Super Speciality Hospital. Recently you are facing a problem in the Children ward. You discuss the problem with the HRM of the hospital and then come up with solutions. The hospital is situated in Kolkata surrounded by a sprawling lawn and a small water body in front of it. It seems like the perfect place to be admitted in. However, the admitted children below 5 years create noise in the ward. They run around as well. The senior patients found their presence quite annoying. Analyse the case and write appropriate solutions. (5M)

Q. 13. Examine the following image and discuss their body language. (6M)



1. Answer All Questions.
 2. For the True/False questions in Part A, justify your answer.
 3. No marks will be given if the explanation of your answer is missing.
 4. The question paper consists of two pages.
-

Part A

1. If $f(x, y) = \begin{cases} 3xy & (x, y) \neq (1, 2) \\ 0 & (x, y) = (1, 2) \end{cases}$ is continuous at $(1, 2)$. (2)
2. $\lim_{(x,y) \rightarrow (2,1)} \frac{\sin^{-1}(xy - 2)}{\tan^{-1}(3xy - 6)}$ does not exists. (2)
3. If $x = f(u, v)$ and $y = g(u, v)$ then $v_x = \frac{1}{J} y_u$ where $J = \frac{\partial(x,y)}{\partial(u,v)}$. (2)
4. The volume of the region common to the intersecting cylinders $x^2 + y^2 = a^2$ and $x^2 + z^2 = a^2$ is $\frac{16a^2}{7}$. (2)
5. The polar moment of interia of the region in the xy -plan bounded by $x^2 - y^2 = 1$, $x^2 - y^2 = 9$, $xy = 2$, $xy = 4$ with unit density is 8. (2)

Part B

6. Find the maximum value of $w = xyz$ on the line of intersection of the two planes $x+y+z=40$ and $x+y-z=0$. (5)
7. Find the critical points of the function $f(x, y) = xy + 2x - \ln x^2y$ in the open first quadrant ($x > 0, y > 0$). (5)
8. Find the volume of the solid cut from the square column $|x| + |y| \leq 1$ by the planes $z = 0$ and $3x + z = 3$. (5)
9. Change the order of integration and evaluate $\int_0^8 \int_{\sqrt[3]{x}}^2 \frac{dydx}{y^4 + 1}$. (5)
10. Find the mass, first moments and moments of inertia about co-ordinate axes of the solid bounded by the planes $x+z=1$, $x-z=-1$, $y=0$ and the surface $y=\sqrt{z}$. The density of the solid is $\delta(x, y, z) = 2y + 5$. (5)

Q. 6. Promote South Goa as a Tourist Destination.

11. Evaluate the integral $\iiint_D dydzdx$ where D is the region with vertices $(0, 0, 0), (1, 1, 0), (0, 1, 0)$ and $(0, 1, 1)$. (5)
12. Transform the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ into the polar form. (10)



National Institute of Technology Goa

Programme Name: B.Tech
Mid Semester Examinations, September 2016

Course Name: Mathematics-I

Date: 21/09/2016

Duration: 90 Minutes

Course Code: MA100

Time: 9:30 - 11:00 A.M

Max. Marks: 50

-
1. Answer All Questions.
 2. For the True/False questions in Part A, justify your answer.
 3. No marks will be given if the explanation of your answer is missing.
 4. The question paper consists of two pages.
-

Part A

1. If $f(x, y) = \begin{cases} 3xy & (x, y) \neq (1, 2) \\ 0 & (x, y) = (1, 2) \end{cases}$ is continuous at $(1, 2)$. (2)
2. $\lim_{(x,y) \rightarrow (2,1)} \frac{\sin^{-1}(xy - 2)}{\tan^{-1}(3xy - 6)}$ does not exists. (2)
3. If $x = f(u, v)$ and $y = g(u, v)$ then $v_x = \frac{-1}{J}y_u$ where $J = \frac{\partial(x,y)}{\partial(u,v)}$. (2)
4. The volume of the region common to the intersecting cylinders $x^2 + y^2 = a^2$ and $x^2 + z^2 = a^2$ is $\frac{16a^2}{7}$. (2)
5. The polar moment of interia of the region in the xy -plan bounded by $x^2 - y^2 = 1$, $x^2 - y^2 = 9$, $xy = 2$, $xy = 4$ with unit density is 8. (2)

Part B

6. Find the maximum value of $w = xyz$ on the line of intersection of the two planes $x+y+z=40$ and $x+y-z=0$. (5)
7. Find the critical points of the function $f(x, y) = xy + 2x - \ln x^2y$ in the open first quadrant ($x > 0, y > 0$). (5)
8. Find the volume of the solid cut from the square column $|x| + |y| \leq 1$ by the planes $z = 0$ and $3x + z = 3$. (5)
9. Change the order of integration and evaluate $\int_0^8 \int_{\sqrt[3]{x}}^2 \frac{dydx}{y^4 + 1}$. (5)
10. Find the mass, first moments and moments of inertia about co-ordinate axes of the solid bounded by the planes $x + z = 1$, $x - z = -1$, $y = 0$ and the surface $y = \sqrt{z}$. The density of the solid is $\delta(x, y, z) = 2y + 5$. (5)

Q. 6. Promote South Goa as a Tourist Destination.

11. Evaluate the integral $\iiint_D dydzdx$ where D is the region with vertices $(0, 0, 0)$, $(1, 1, 0)$, $(0, 1, 0)$ and $(0, 1, 1)$. (5)

12. Transform the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ into the polar form. (10)



Roll No											
---------	--	--	--	--	--	--	--	--	--	--	--

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

Programme Name: B.Tech

End Semester Examinations, Nov-2017

Course Name: Professional Communication-1

Course Code: HU100

Date: 25 /11/2017

Duration: 3 hrs

Time: 2:00PM

Max. Marks: 100

ANSWER ALL QUESTIONS

- Answer all the questions
- Don't break the sequence
- Don't write the answer of the same question in parts at different places
- Follow full block format of writing, wherever necessary

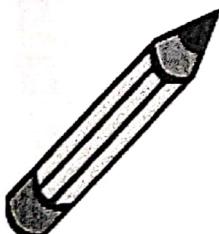
Q.1. Read the case & find out an empathetic solution of this case. (7)

Hitech Pvt Ltd is a Korean company, which produces high technology goods such as CD players. Recently they opened a factory in the town of Ponda, Goa. The factory is doing well with 69% of its sales coming from the Mumbai market. However, the relation with the local people is poor.

Also, the anticipated benefits to the town from the factory haven't materialized, as most of the workforce needed to be highly skilled and were brought in from other areas, thus providing little local employment. These non-locals were highly paid and have pushed up prices in the local shops, which leads to resentment. What should the company do now?

- Find out an empathetic solution for this case.

Q. 2. Prepare an advertisement for the following product: (6)



Q3. Write down the meanings and make sentences with the following group verbs (9X2=18)

- a. Make out, b. Give Up, c. Back down, d. Call off, e. Get away, f. Shop Around, g. Wear out,
- h. Put on, i. Get along

Q. 6. Promote South Goa as a Tourist Destination.

Q. 4. Imagine that you are the Production Manager of Rainbow Real Estate Company, Bangalore. Your company wishes to build row house in Ponda. As a production manager, examine the feasibility of this project and write a report to the general manager of your company. (10) (8)

Q.5. Write a paragraph on Inbox has replaced Postbox.

Q.6. Imagine that you are the Production Manager of Glaxo Pvt. Ltd, Mumbai. Your company has launched a new product called *24x7 Fresh Wipes*. Promote this product to your potential customers. (8)

Q. 7. Mr. A: Hello B! How are you?

Mr. B: I am fine. (Looks at other direction)

Analyse the body language of B with reference to Kinesics. (5)

Q.8. Assume that you are the secretary of Students' Council of your institute. Prepare the minutes of the 3rd Council meeting held on 10/10/2017. The issues discussed are the following:

- Ragging
- Cultural Fest
- Theft
- Discipline

(10)

Q.9. Compare and Contrast Verbal and Non Verbal Communication. (7)

Q.10. Punctuate the following sentences:

(3)

- a. Spain is a beautiful country the beaches are warm sandy and spotlessly clean
- b. Sarahs uncles car was found without its wheels in that old derelict warehouse
- c. That tall man Pauls grandfather is this months winner.

Q.11. What are the proof reading symbols of the following directive verbs? (2)

- a. Delete, b. Insert, c. Give space, d. Capitalize

Q.12. Prepare a user manual of a Washing Machine of your choice. (8)

Q.13. You have bought a Sony Bravia television a week ago. But it is not functioning properly. Write a letter of complaint to the store manager and adjust your claim. (Invent the necessary details) (8)

- Do not break the sequence

Q.1 Explain the relevance of Empathy in any profession? (5)

Q.2. Why does Grapevine communication develop? Explain with examples. (5)

Q.3. What are the communication barriers? Why do they arise? How can they be removed? (5+5+4)

Q. 4. Analyze the pros and cons of the space management of the big conference hall of library block of NIT Goa? (8)

Q.5. What relationship exists between non-verbal and verbal behavior? (7)

Q.6. The tourism department of Goa has been facing a fiasco since 2014 relating to the inflow of the Russian tourists. Russians have stopped visiting the state. Write a Press Release stating that Goa is the perfect tourist destination for the Russians. (8)

Q.7. Mr. X is not looking at you while you are talking to him interpersonally. State the reasons. (3)



1st Year

Roll no _____

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa 403 401

Programme Name: B.Tech

End Semester Examination, April/May-2015

Course Name: Elements of Mechanical Engineering

Course Code: ME150

Date: 29-04-2015

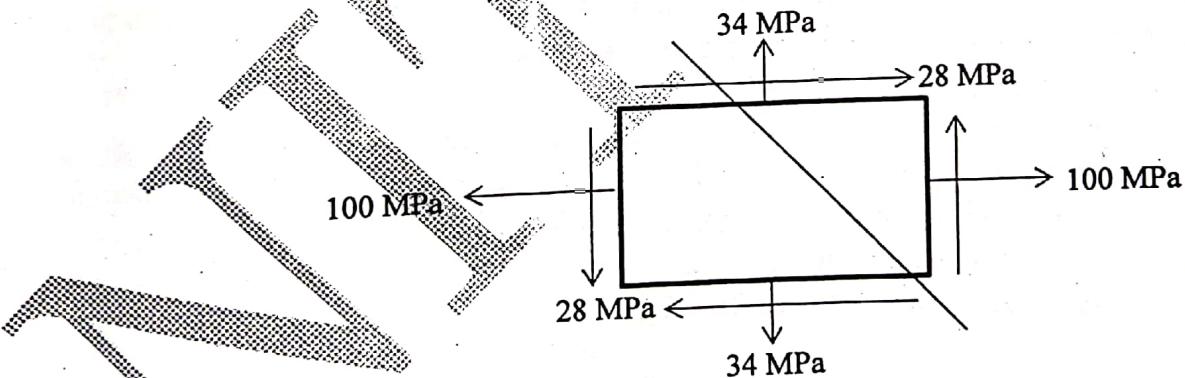
Time: 2 PM- 5 PM

Duration: 3 Hours

Max. Marks: 100

ANSWER ALL QUESTIONS

1. An air-standard Dual cycle operates with a compression ratio of 14. The conditions at the beginning of compression are 100 kPa and 300 K. The maximum temperature in the cycle is 2200 K and the heat added at constant volume is twice the heat added at constant pressure. (a) Draw p-v diagram of the dual cycle and determine (b) The pressure, and temperature at each corner of the cycle, (c) The thermal efficiency of the cycle, and (d) the mean effective pressure. Given $C_p = 1.005 \text{ kJ/kg-K}$, $C_v = 0.718 \text{ kJ/kg-K}$. (14 marks)
2. As shown in the following figure, an element in plane stress at the surface of a large machine is subjected to the stresses $\sigma_x = 100 \text{ MPa}$, $\sigma_y = 34 \text{ MPa}$, $\tau_{xy} = 28 \text{ MPa}$. Determine the following: (a) the normal and shear stresses acting on an element inclined at an angle $\Theta = 40^\circ$, (b) principal stresses along with their planes and (c) maximum shear stress along with its plane. (12 marks)



3. (a) If a thin walled cylindrical pressure vessel of internal radius r and wall thickness t is subjected to an internal pressure p , then derive the expressions for longitudinal stress (σ_l) and hoop stress (σ_h) in terms of r , t and p .
- (b) A cylindrical pressure vessel is 3m long and its ends are closed. Its internal diameter is 1m and wall thickness is 15mm. if it is subjected to an internal pressure of 1.5 MPa, find out longitudinal and hoop stresses.

Q. 6. Promote South Goa as a Tourism destination

- (c) A thin walled spherical pressure vessel of internal radius r and wall thickness t is subjected to an internal pressure p , then derive the expression for hoop stress (σ_h) in terms of r , t , and p .
(d) Consider a steel spherical pressure vessel of radius 1000mm having a wall thickness of 10mm. Determine, the maximum membrane stresses caused by an internal pressure of 0.8 MPa. (12 marks)
4. A two stroke CI engine develops a brake power of 368 kW while its frictional power is 73.6 kW. Its fuel consumption 180 kg per hour, and works with an Air /Fuel ratio 20:1. The heating value (or calorific value) of the fuel is 42 MJ/kg. Calculate the following: (a) indicated power, (b) mechanical efficiency, (c) Brake thermal efficiency, (d) Indicated thermal efficiency, and (e) air consumption per hour. (12 marks)
5. A steam power plant operates on the Rankine cycle. The steam enters the turbine at 7.0 MPa and 550°C with a velocity of 30 m/sec. It discharges to the condenser at 20kPa with a velocity of 90m/sec as wet steam. Saturated liquid water is discharged from the condenser. (a) Draw the T-S diagram. For a flow rate of 37.8 kg/sec., calculate (b) the thermal efficiency, (c) the net power produced. (14 marks)
6. A refrigerator uses R-134a as the working fluid and operates on ideal vapor compression cycle between 0.14 MPa and 0.8 MPa. The mass flow rate of the refrigerant is 0.06 kg/sec. The enthalpies of the fluid at the exit of the evaporator, exit of the compressor, and exit of the condenser are 236.04 kJ/kg, 272.05 kJ/kg and 93.42kJ/kg respectively. Determine (a) the rate of heat removal from the refrigerated space, (b) power input to the compressor, (c) the heat rejection rate in the condenser, and (d) the COP. (12 marks)
7. For the steam existing at an absolute pressure of 15 bar, find the following: (a) enthalpy when the steam is wet and its dryness fraction is 0.8, (b) enthalpy when it is superheated and its temperature is 300°C, (c) specific volume when the steam is wet and its dryness fraction is 0.8, (d) specific volume when its temperature is 300°C. Take specific heat at constant pressure for superheated steam as 2.3 kJ/kgK. (12 marks)
8. A household refrigerator that has a power input of 450 W and a COP of 2.5 is to cool five large watermelons, 10 kg each to 8°C. If the watermelons are initially at 20°C, determine how long it will take for the refrigerator to cool them? The watermelons can be treated as water whose specific heat is 4.2. kJ/kg·°C. (12 marks)



Roll no. _____

National Institute Of Technology Goa

Farmagudi, Ponda, Goa 403 401

Programme Name: B. Tech
Mid Semester Examinations, September-2015

SET 3

Course Name: Engineering Drawing
Date: 01/10/2015
Duration: 1 Hour and 30 minutes

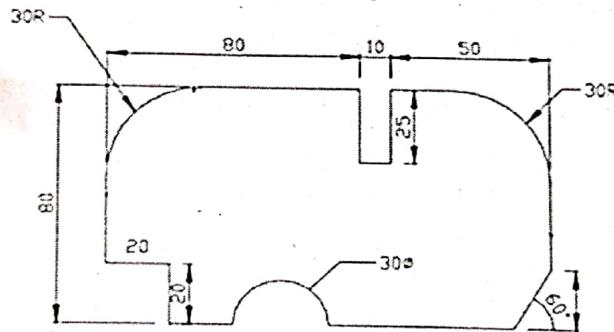
Course Code: ME 101
Time : 2.00-3.30 pm
Max. Marks: 50

Please read the following instructions before solving:

All dimensions are in mm
Use first angle projection method
Use aligned dimensioning system
Retain Construction lines
Line work and neatness carries weightage

ANSWER ALL QUESTIONS

1. Correct the following figure and redraw it according to general rules for dimensioning. (10 marks)



2. Point A 50 mm Below HP, 30 mm Behind VP, and 40 mm from the left PP. Draw its projections on to principal planes (10 marks)

3. A line CD, inclined at 25° to the HP, measures 80 mm in TV. The end C is in the first quadrant and 24 mm and 14 mm from the HP and the VP respectively. The end D is at equal distances from both the reference planes. Draw the projections, find TL and true inclination with the VP. Also, locate the traces. (16 marks)

4. An equilateral triangle, side 60mm, is perpendicular to both the HP and the VP. One of the corners of the triangle is on the HP and an edge through that corner is inclined at 45° to the HP. Draw the projections of triangle (Right side view, front view and top view). (14 marks)



Roll no _____

National Institute Of Technology Goa

Farmagudi, Ponda, Goa 403 401

SET 4

**Programme Name: B. Tech
Mid Semester Examinations, September-2015**

Course Name: Engineering Drawing

Date: 01/10/2015

Duration: 1 Hour and 30 minutes

Course Code: ME 101

Time : 2.00-3.30 pm

Max. Marks: 50

Please read the following instructions before solving:

All dimensions are in mm

Use first angle projection method

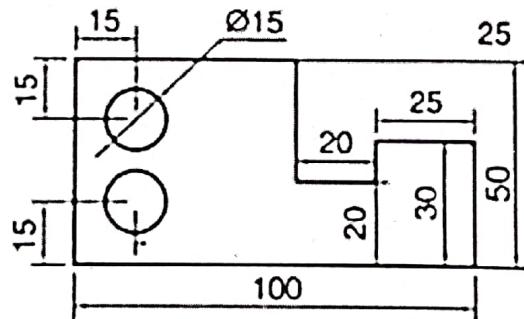
Use aligned dimensioning system

Retain Construction lines

Line work and neatness carries weightage

ANSWER ALL QUESTIONS

1. Correct the following figure and redraw it according to general rules for dimensioning. **(10 marks)**



2. Point A 50 mm Behind VP, 40mm above HP, and 30 mm from the left PP. Draw its projections on to principal planes. **(10 marks)**

3. The line joining HT and v (vertical trace projection on the reference line) is 10 mm long and HT is in front of VP. The top view of the line PQ measures 65 mm and is inclined at 45° with 'xy' line and the P is 20 mm above HP and 25 mm in front of VP. Draw the projections of the line. Also, find its true length and true angles of inclinations. **(16 marks)**

4. A regular pentagon ABCDE of side 40 mm is inclined at 60° to the VP and perpendicular to the HP. The side AB is perpendicular to the HP. Draw the projections of the pentagon. **(14 marks)**



Roll no _____

National Institute Of Technology Goa

Farmagudi, Ponda, Goa 403 401

SET 2

**Programme Name: B. Tech
Mid Semester Examinations, September-2015**

**Course Name: Engineering Drawing
Date: 01/10/2015
Duration: 1 Hour and 30 minutes**

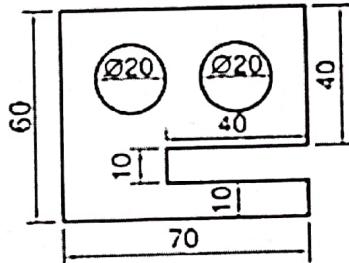
**Course Code: ME 101
Time : 11.00-12.30 pm
Max. Marks: 50**

Please read the following instructions before solving:

All dimensions are in mm
Use first angle projection method
Use aligned dimensioning system
Retain Construction lines
Line work and neatness carries weightage

ANSWER ALL QUESTIONS

1. Correct the following figure and redraw it according to general rules for dimensioning. (10 marks)



2. Point A 40 mm behind VP, 60 mm Below HP, and 25 mm from the right PP. Draw the projections of points on to principal planes. (10 marks)

3. A line AB of length 58 mm is inclined at 23° to HP, the end A being 30 mm above HP. The HT and VT are 15 mm and 20 mm below the reference line (xy line) respectively, and the distance between the projectors of HT and VT is 30 mm apart. Draw the projections of the line and find the inclination of the line with the VP. (16 marks)

4. A regular pentagon ABCDE of side 30 mm is inclined at 45° to the VP and perpendicular to the HP. The side AB is perpendicular to the IIP. Draw the projections of the pentagon. (14 marks)



National Institute Of Technology Goa
Farmagudi, Ponda, Goa 403 401

Roll no _____

Programme Name: B. Tech
Mid Semester Examinations, September-2015

SET 1

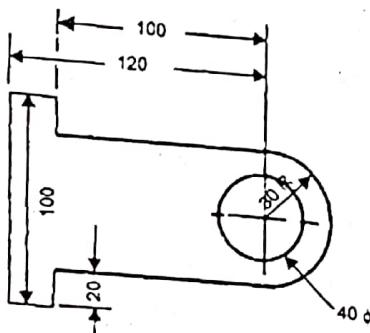
Course Name: Engineering Drawing
Date: 01/10/2015
Duration: 1 Hour and 30 minutes

Course Code: ME 101
Time : 11.00-12.30 pm
Max. Marks: 50

Please read the following instructions before solving:
All dimensions are in mm
Use first angle projection method
Use aligned dimensioning system
Retain Construction lines
Line work and neatness carries weightage

ANSWER ALL QUESTIONS

1. Correct the following figure and redraw it according to general rules for dimensioning. (10 marks)



2. Point A 40 mm Behind VP, 50mm above HP, and 30 mm from the left PP. Draw its projections on to principal planes. (10 marks)
3. A line AB of length 65 mm is inclined at 30° to HP, the end A being 30 mm above HP and 25 mm in front of VP. The line joining the front view of the end A and h (horizontal trace projection on the reference line) is 35 mm. Draw the projections of the line and locate the traces. Also find the inclination of the line with VP. (16 marks)
4. A regular pentagonal lamina of 30 mm sides has one of its sides on VP. Draw its projections when the plane is vertical and inclined at 45° to VP. (14 marks)



Roll no									
---------	--	--	--	--	--	--	--	--	--

National Institute of Technology Goa

Farmagudi, Ponda, Goa 403 401

Programme Name: B.Tech

Mid Semester Examinations, September-2015

Course Name: Physics

Course Code: PH100

Date: 30.09.2015

Time: 9.30-11.00

Duration: 1 Hour and 30 minutes

Max. Marks: 50

ANSWER ALL QUESTIONS

1. A particle of total energy E is moving in a one dimensional potential given by

$$V(x) = 0, \quad \text{for } x < 0$$

$$V(x) = V_0, \quad \text{for } x > 0$$

Calculate the reflection coefficient for the case $E > V_0$ and $0 < E < V_0$ (7M)

2. The normalized wave function for certain particle is $\Psi(x) = \sqrt{\frac{3}{\pi}} \cos x, -\frac{\pi}{2} < x < \frac{\pi}{2}$. Calculate the probability of finding the particle between $0 < x < \frac{\pi}{2}$ (5M)

3. The maximum energy of photoelectrons from aluminium is 2.3 eV for radiation of 200 nm and 0.90 eV for radiation of 258 nm. Use these data to calculate plank's constant and the work function of aluminium. (4M)

4. Consider a particle whose normalized wave function is $\Psi(x) = 2\alpha\sqrt{\alpha}xe^{-\alpha x}, x > 0$

$$\Psi(x) = 0 \quad x < 0$$

(a) For what value of x does $P(x) = |\Psi(x)|^2$ peak?

(b) What is the probability that the particle is found between $(x) = 0$ and $x = 1/\alpha$? (6M)

5. Discuss the failures of classical physics and how does quantum mechanics overcome these failures. (5M)

6. Derive both time independent and time dependent Schrödinger equations for a non-relativistic particle. (6M)

7. State Heisenberg's uncertainty principle and use it to prove the non-existence of electron inside the nucleus. (5M)

8. An electron of energy 200 eV is passed through a circular hole of radius 10^{-4} cm. What is the uncertainty introduced in the angle of emergence? (5M)

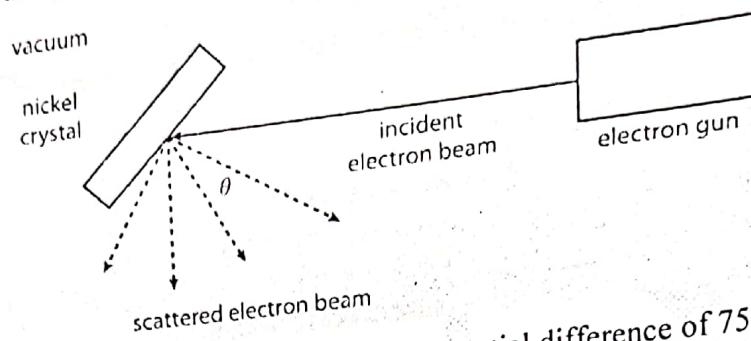
P.T.O

Page 1 of 2

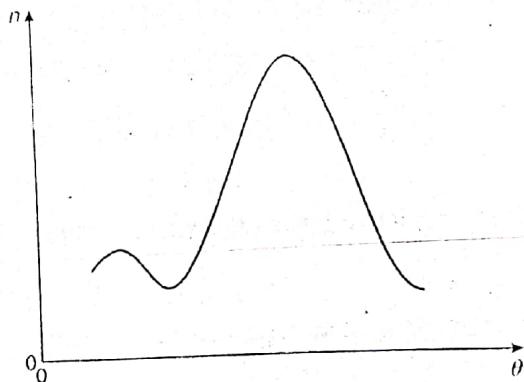
Q. 6. Promote South Goa as a Tourism Destination

9. An experiment is carried out in which a beam of electrons is scattered from a single nickel crystal. A schematic diagram of the apparatus is shown below.

(7M)



The electrons are accelerated in the electron gun by a potential difference of 75V. (a) Determine the wavelength associated with the electrons as predicted by the de Broglie hypothesis. The number n of electrons scattered per second through an angle θ is measured. The graph below shows the variation with angle θ of n .



- (b) How the shape of this graph supports the de Broglie hypothesis.

ALL THE BEST

Roll No							
---------	--	--	--	--	--	--	--



National Institute of Technology Goa

Programme Name: B.Tech.

Mid Semester Examinations, September 2015

Course Name: MA 100

Date: 29/09/2015

Duration: 1 Hour 30 minutes

Course Code: Mathematics-I

Time: 2.30 to 4.00 pm

Max. Marks: 50

ANSWER ALL QUESTIONS

- Compute with justification: [1+2+2]
 - $\lim_{x \rightarrow \infty} x \sin\left(\frac{1}{x}\right)$
 - $\int \frac{x^2 - 1}{x^4 + 3x^2 + 1} dx$
 - $\lim_{x \rightarrow 0} \frac{1}{x^3} \int_0^x \frac{t^2}{t^4 + 1} dt$
- State and prove the Mean Value Theorem. [5]
- A rectangle is to be inscribed in a semicircle of radius 2. What is the largest area the rectangle can have, and what are its dimensions? [5]
- Show that if $r(x) = 6x$ and $c(x) = x^3 - 6x^2 + 15x$ are your revenue and cost functions, then the best you can do is break even (have revenue equal cost). [5]
- Find a curve through the point $(0, 1)$ whose length integral is $L = \int_1^2 \sqrt{1 + \frac{1}{y^4}} dy$. How many such curves are there? Give reasons. [5]
- Find the area of the surface generated by revolving the curve $y = \sqrt{x^2 + 2}$, $0 \leq x \leq \sqrt{2}$, about x-axis. [5]
- Find the centroid of the region cut from the first quadrant by $y = \frac{1}{\sqrt{x+1}}$ and the line $x = 3$. [5]
- Let D be bounded region in the first quadrant of the xy-plane bounded by the curves $y = x^2$ and $y = 2 - x^2$. Using both the Washer method and the Shell method, find the volume of the solid of revolution obtained by revolving D about the y-axis. [5]
- The length of one arch of the curve $y = \sin x$ is given by $L = \int_0^\pi \sqrt{1 + \cos^2 x} dx$. Estimate L by Simpson's Rule with $n = 8$. [5]
- Show that the $f(x) = (x - a)^2(x - b)^2 + x$ takes on the value $\frac{(a+b)}{2}$ for some value of x. [5]



Roll no								
---------	--	--	--	--	--	--	--	--

National Institute Of Technology Goa

Farmagudi, Ponda, Goa 403 401

**Programme Name: B. Tech
Mid Semester Examinations, September-2015**

Course Name: Engineering Mechanics
Date: 29/09/2015
Duration: 1 Hour and 30 minutes

Course Code: ME 100
Time: 09.30 -11.00 A.M
Max. Marks: 50

ANSWER ALL QUESTIONS

1. a) Explain the following terms as used in engineering mechanics. (i) Rigid Bodies (ii) Particle **(2 Marks)**

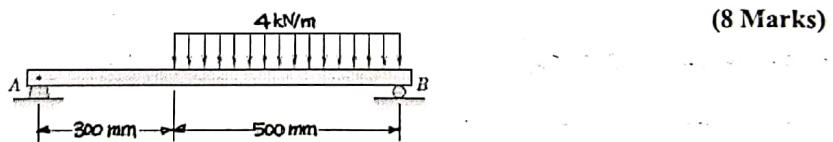
1. b) The following forces act at a point :

- (i) 20 N inclined at 30° towards North of East, (ii) 25 N towards North (iii) 30 N inclined at 45° towards North West, and (iv) 35 N inclined at 40° towards South of West.

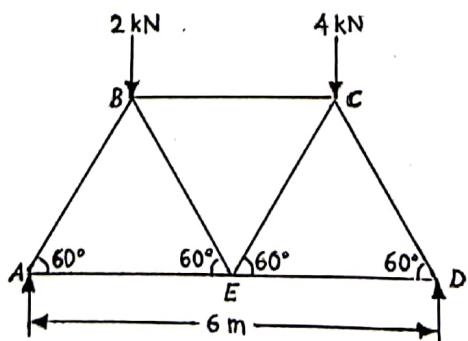
Find the magnitude and direction of the resultant force. **(10 Marks)**

2. a) State Varignon's theorem. **(2 Marks)**

2. b) Determine the reactions at *A* and *B* for the beam subjected to the loading as shown in figure below.



3. Figure below shows a Warren girder consisting of seven members each of 3 m length freely supported at its end points. The girder is loaded at *B* and *C* as shown. Find the forces in all the members of the truss. Also, check whether the girder is a perfect frame? **(10 Marks)**

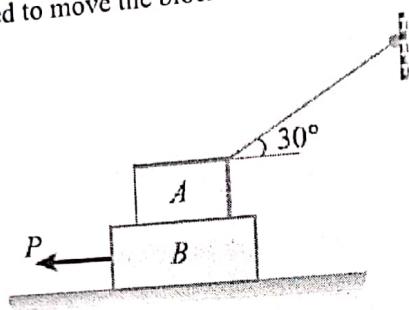


Q. 6. Promote South Goa as a Tourism Destination

(3 Marks)

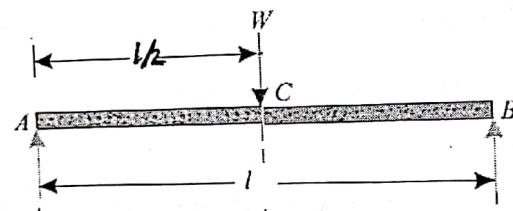
4. a) State Coulomb's law of friction.

4. b) Two blocks A and B of weights 1 kN and 2 kN respectively are in equilibrium position as shown in figure below. If the coefficient of friction between the two blocks as well as the block B and the floor is 0.3, find the force (P) required to move the block B. (7 Marks)



(8 Marks)

5. Draw the SFD and BMD for the Simply Supported Beam shown in figure below.



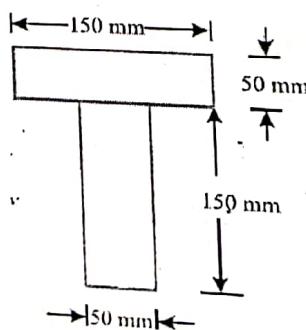
(OR)

6. a) What is the difference between center of gravity and centroid?

(2 Marks)

6. b) Find the moment of inertia of a T-section shown in figure below about X-X axes through the center of gravity of the section

(6 Marks)





Roll no _____

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa 403 401

**Programme Name: B.Tech
Mid Semester Examination, September 2015**

Course Name: Professional Communication

Course Code: HU 100

Date: 28/09/2015

Time: 2.30 p.m. - 4:00 p.m.

Max. Marks: 50

Instructions:

Don't break the sequence, while answering the questions

Don't answer any question partially at different places of the script

1. Compare and contrast verbal and non-verbal communication. (10)
2. Consider the extent to which different electronic communication technologies such as email and SMS have replaced the traditional forms of communication. (8)
3. Discuss the Proxemics of N4 classroom of NIT Goa with pros and cons. (10)
4. Prepare a user manual of Videocon Washing machine. (8)
5. As a manager of Samsung Company, write a Memo in full block format informing the employees not to use the Office Landline phone for personal use. (5)
6. What are the differences between a CV and a Résumé? Prepare a Résumé for the following post respectively:

- Software Developer (for CSE students)
- Assistant Engineer in the Dept of Telecommunications (GoI) (for ECE students)
- Assistant Engineer in State Electricity Board (for EEE students) (3+6=9)



Roll no _____

National Institute Of Technology Goa

Farmagudi, Ponda, Goa 403 401

Programme Name: B.Tech

Mid Semester Examinations, September-2015

Course Name: Computer Programming and Problem Solving

Course Code: CS100

Date: 28/9/2015

Time: 9:30am – 11:00am

Duration: 1 Hour and 30 minutes

Max. Marks: 50

ANSWER ALL QUESTIONS

Q1. Convert the decimal number 63545 to binary and hexadecimal [3M]

Q2. Write the ASCII code for the license plate GA08-M-3781

Note that the ASCII code for hyphen is 45 or 0x2d. You may choose any number system. [4M]

Q3. Explain precisely the difference between each of the following. Please provide examples to supplement your answers. [15M]

- a) little endian format and big endian format
- b) compile time error and runtime error
- c) printf() and fprintf()
- d) logical operator || and bitwise operator |
- e) address of operator (&) and dereference operator (*)

Q4. Write a simple C program to return 3 integers from a function using a structure. [6M]

Q5. Write a C program to [8M]

- a) Check if a given integer is even or odd.
- b) Display the sum of the following series: $1^2 + 3^2 + 5^2 + 7^2 + \dots + N^2$ where input N is an odd integer.

Q6. Read the code carefully and explain the difference between the two programs in Fig1. and Fig2. i.e what does each program accomplish? [6M]

```
#include <stdio.h>
int main()
{
    int x = 10, y = 5;
    x = x + y;
    y = x - y;
    x = x - y;

    return 0;
}
```

Fig. 1

```
#include <stdio.h>
int main()
{
    int x = 10, y = 5;
    x = x ^ y;
    y = x ^ y;
    x = x ^ y;

    return 0;
}
```

Fig. 2

Q. 6. Promote South Goa as a Tourism Destination

Q7. Read the code carefully and explain with an example what does the following program accomplish. [8M]
Please break up your explanation as per the statement blocks indicated below:

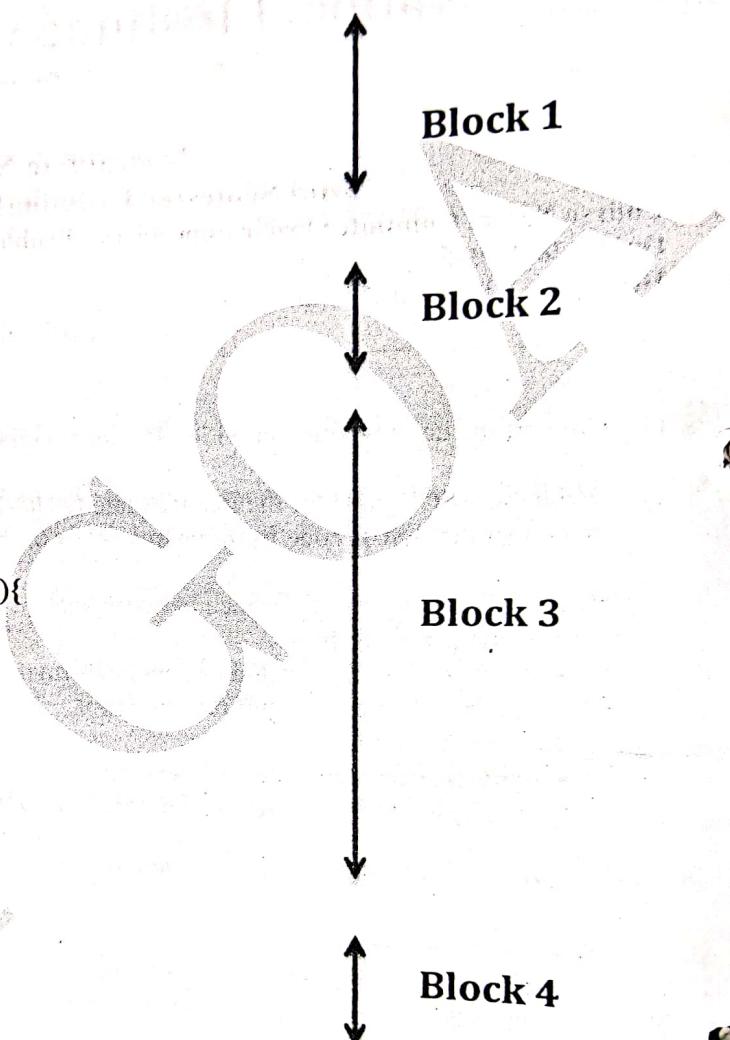
```
#include<stdio.h>
int main(void)
{
    int a[10];
    int i, j, n, c, min_idx,temp;
    scanf("%d", &n);

    for (c = 0; c < n; c++) {
        scanf("%d", &a[c]);
    }

    for (i = 0; i < n-1; i++)
    {
        min_idx = i;
        for (j = i+1; j < n; j++){
            if (a[j] < a[min_idx]){
                min_idx = j;
            }
        }

        temp = a[min_idx];
        a[min_idx] = a[i];
        a[i] = temp;
    }

    for (i = n-1; i >= 0; i--)
        printf("%d ", a[i]);
}
```



*** Good Luck ***



Roll no _____

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa 403 401

Programme Name: B.Tech/M.Tech/Ph.D
Mid Semester Examination September 2014

Course Name: Professional Communication

Date: 17/09/2014

Time: 2.30p.m.-4.p.m.

Course Code: HU 100

Max. Marks: 50

Instructions: Don't break the sequence, while answering the questions.

(Group-A)

(Multiple Choice Questions)

Any 10

$$10 \times 1 = 10$$

1. Bio data is of:
 - a. One type, b. Two types, c. Three types, d. Four types
2. A tendency to "steal" is known as
 - a. Claustrophobia, b. Kleptomania, c. Insomnia, d. Phobia
3. Chronemics refers to the use of
 - a. Touch, b. Colour, c. Time, d. Space
4. What does "O" stand for in SWOT Analysis
 - a. Overall, b. Opportunities, c. Opportunist, d. Opposite
5. Biased Listening is the result of
 - a. Semantics, b. Ego/I-Attitude, c. Inferiority Complex, d. None of these
6. Body Language is
 - a. Structured, b. Developed, c. Voluntary, d. Involuntary
7. Brainstorming is
 - a. Neurological Problem, b. Extempore, c. Group Discussion, d. None of these
8. Letter of Application in response to an Advertisement is called
 - a. Cover Letter, b. Solicited Cover Letter, c. Unsolicited Cover Letter, d. Job Application Letter
9. Which of the following is not an example of external operational communication?
 - a. Business Letter, b. Brochure, c. Advertisement, d. Circular
10. Announcement in a railway station serves as an instance of
 - a. Interpersonal Communication, b. Mass Communication, c. Meta Communication, d. Intrapersonal Communication
11. Which one of the following is not a form of Oral Communication?
 - a. Dictation, b. Proposals, c. Impromptu Speech, d. None of these

(Group B)

1. Prepare an advertisement of Sony Cell Phone with android OS. (4)
2. Define Noise? What are the different types of Noise in Corporate Communication? Define them with examples? How can Noise be minimized? (2+3+3+2=10)
3. Write a short note on Grapevine with classification, advantages and disadvantages. (6)
4. What is listening? What are the types? Define them. State the differences between Hearing and Listening. (2+3+3+2=10)

(Group C)

1. As a secretary of the Students' Council of NIT Goa, write a notice informing all the students regarding the forthcoming Quiz Contest.
2. As a manager of your company, write a Memo in full block format informing the employees not to use the Office Landline phone for personal use.

$$(5 \times 2 = 10)$$

Mid Semester Examination

Semester: 1st

Year: 1st

Course Name: Professional Communication 1

Course Code: HU100

Duration: 1 hour 30 mins

July-Dec 2013

Dept: Humanities and Sciences

Max. Marks: 50

Instructions: Answer all the Questions

1. Write short notes on

Proxemics, Functions of Communication, Listening and its types

(6x3=18)

2. Write a notice for the students of your Institute informing them of a Picnic.

(5)

3. Write two differences between CV and Resume. "SONY has advertised a post of Project Manager in the area of EEE", prepare a Cover Letter in response to this advertisement dated September 15, 2013 in Times of India and submit a CV.

(2+8+7=17)

4. Compare and Contrast Verbal and Nonverbal Communication.

(6)

5. Define Mass Communication and Interpersonal Communication.

(4)

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Mid Semester Examination

Year: 2013-2014

Semester: 1st

July-Dec 2013

Dept: EEE/ECE/CSE

Course Name: Engineering Drawing

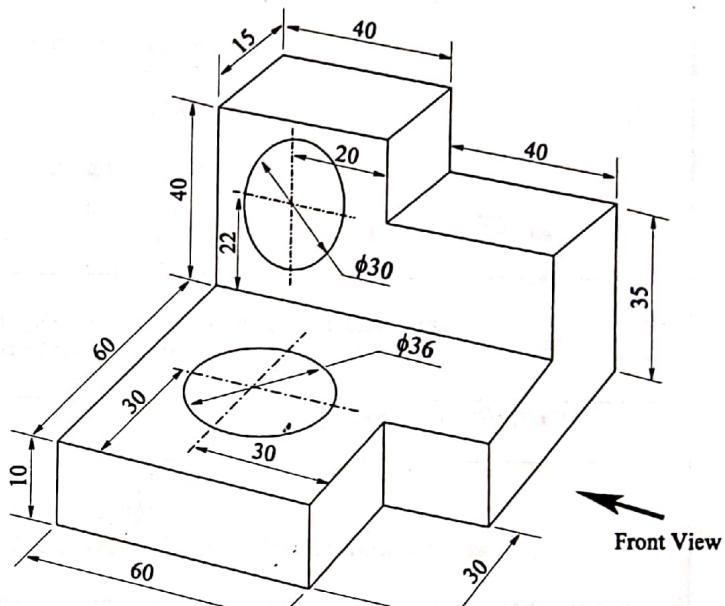
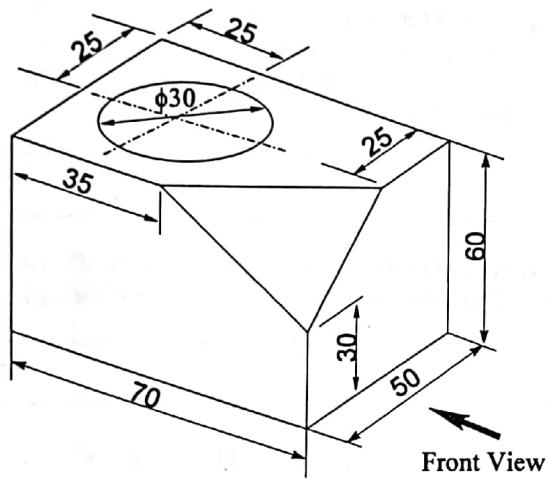
Course Code: ME101

Duration: 2 hours

Max. Marks: 50

Instructions: Answer all the questions. Each question carries 12.5 marks. Make suitable assumptions wherever necessary. All dimensions are in mm.

1. Draw the first angle projection (front, top, and left hand side view) of the object shown in fig. 1.



2. Draw the first angle projection (front, top, and left hand side view) of the object shown in fig. 2.
3. Two lines AB and AC make an angle of 120^0 between them in their front view and top view (point A is the common end of the two lines). AB is parallel to both the H.P. and the V.P. Determine the real angle between AB and AC.
4. A line AB, 60 mm long, is inclined at 45^0 to the H.P. and its top view makes an angle of 60^0 with the V.P. The end A is in the H.P. and 12 mm in front of the V.P. Draw its front view and find its true inclination with the V.P.

Reg.No								
--------	--	--	--	--	--	--	--	--

- c) What is the output of the following code?

```
int main()
{
    int x=4, y,z;
    y = --x ;
    z = x -- ;
    printf("%d %d %d", x , y, z);
    return 0;
}
```

- d) What is the difference between the literals 7 and '7'?

- e) Write a Program to print all the ASCII values and their equivalent characters using while loop. The ASCII values vary from 0 to 255.

*****END*****

Sem I/ME

Roll no								
---------	--	--	--	--	--	--	--	--

NATIONAL INSTITUTE OF TECHNOLOGY GOA
[Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.]

Mid Semester Examination

Course Name: Engineering Graphics

September 2012

Course Code: ME 101

Section: A& B

Year: I

Date: 28/09/12

Time: 9.30AM to 11.30PM

Duration: 2Hr

Max. Marks: 50

Instructions: Answer All Questions

1. Draw the projections of following points on the same ground line , keeping the projectors 25mm apart
A, 30mm below HP and 15 mm behind VP
B, 15mm above HP and 40mm in front of VP
C, in the VP and 20mm above Hp 10 marks
2. A 75 mm long line is parallel to and 30 mm in front of the VP its one end is 10mm above the HP. While the other is 50mm above the HP. Draw its projections and find its inclination with HP. 10 marks
3. A line CD, 60mm long, is inclined at 50° to the HP and 30° to the VP. Its end C is in VP and 30mm above the HP. The end D is in the first quadrant. Draw its projections and determine its traces. 10 marks
4. A line PQ, 100 mm long, is inclined at 45° to the HP and at 30° to the VP. Its end P is in the second quadrant and Q is in the fourth quadrant. A point R on PQ 40 mm from P is in both the planes. Draw the projections of PQ. 20 marks



Sem I/CY

Roll no									
---------	--	--	--	--	--	--	--	--	--

NATIONAL INSTITUTE OF TECHNOLOGY GOA

[Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.

Mid Semester Examination September 2012

Course Name: Chemistry

Course Code: CY100

Branch: I B.Tech, Section: A, Date: 25/09/2012

Time: 9.30 - 11.00 am Duration: 1.30 min. Max. Marks: 50

Instructions: All questions are compulsory.

1. What is decomposition potential? How is it determined? What is its significance in electrolysis? (1 + 2 + 2) M
2. Explain the principle involved in electrolessplating. What are the advantages? Explain the electrolessplating of copper. (2 + 1 + 2) M
3. Construct the following Batteries with detailed explanation.
 - a. Zn / (ZnCl₂), NH₄Cl / MnO₂, C
 - b. Pb, PbSO₄ / H₂SO₄ (aq) / PbO₂, Pb (2 + 3) M
4. Set up the electrochemical cell for the following reaction,
$$\text{Fe}^{3+}(\text{aq}) + \text{Sn}^{2+}(\text{aq}) \rightarrow \text{Fe}^{2+}(\text{aq}) + \text{Sn}^{4+}(\text{aq})$$
And calculate the equilibrium constant for the reaction.
$$E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771\text{V}, E^\circ_{\text{Sn}^{4+}/\text{Sn}^{2+}} = 0.151\text{V.}$$
 (1 + 4) M
5. Calculate the potential of the cell Cr / Cr³⁺ (0.1 M) // Fe²⁺ (0.01 M) / Fe
$$E^\circ_{\text{Fe}^{2+}/\text{Fe}} = -0.447\text{ V}, E^\circ_{\text{Cr}^{3+}/\text{Cr}} = -0.744\text{ V}$$
 5M



6. a. Give reason for "Copper equipment should not possess steel bolt".
b. Can we use Aluminium in place of Zinc for cathodic protection of iron from rusting?
Why? (Hint. Galvanic series) (2 + 1 + 1) M
- c. Why Iron corrodes faster than Aluminium, even though iron is placed below aluminium in the electrochemical series?
7. What are the types of protective coatings? How do protective coatings help in controlling corrosion? (1 + 4) M
8. Write short notes on
a. Priming and Foaming.
b. Phosphate conditioning.
c. Caustic embrittlement (2 + 2 + 2) M
9. a. Describe the demineralization of water by ion-exchange method.
b. Mention the disadvantages of using hard water for any two industries (3 + 2) M
10. a. Differentiate between Lime soda process and Permutit process.
b. A sample of water is found to contain 40.5 mg/L $\text{Ca}(\text{HCO}_3)_2$, 46.5 mg/L $\text{Mg}(\text{HCO}_3)_2$, 27.6 mg/L MgSO_4 , 32.1 mg/L CaSO_4 and 22.45 mg/L CaCl_2 . Calculate the total hardness of water? [At Wt. Ca = 40, Mg = 24, C = 12, S = 32, O = 16, Cl = 35.5, H = 1] (3 + 2) M

-----All The Best-----

Mid Semester Examination
Department of Humanities and Sciences

Year: I

July-Dec 2013

Semester: I

Course Name: Mathematics-I
Duration: 90 Min.

Course Code: MA 100
Max. Marks: 50 M

ANSWER ALL THE QUESTIONS

Part-A (6 X 3=18 Marks)

1. Test the convergence of the series $\sum \frac{\sqrt{n}}{n^2+1}$.
2. Discuss the nature of the series $\frac{2}{3.4}x + \frac{3}{4.5}x^2 + \frac{4}{5.6}x^3 + \dots \quad (x > 0)$
3. Discuss the convergence of the series $\sum \frac{\cos n\pi}{n^2+1}$
4. Obtain the half range sine series for the function $f(x) = k$ (k is constant) in $[0, l]$.
5. Find the Fourier series expansion for $f(x) = \sin^2 x$ in the interval $[-\pi, \pi]$.
6. Verify Rolle's theorem for the function $f(x) = \frac{\sin x}{e^x}$ in $[0, \pi]$

Part-B (2 X 16=32 Marks)

1. (a) Examine the character of the series

$$\frac{1}{2^3} - \frac{1}{3^3}(1+2) + \frac{1}{4^3}(1+2+3) - \frac{1}{5^3}(1+2+3+4) + \dots \quad [8M]$$

- (b) Show that $\log(1+e^x) = \log 2 + \frac{x}{2} + \frac{x^2}{8} - \frac{x^4}{192} + \dots$ and hence deduce that

$$\frac{e^x}{e^x + 1} = \frac{1}{2} + \frac{x}{4} - \frac{x^3}{48} + \dots \quad [8M]$$

2. (a) The intensity of an alternating current after passing through a rectifier is given

by $i(x) = \begin{cases} I_0 \sin x, & \text{for } 0 < x < \pi \\ 0, & \text{for } \pi < x < 2\pi \end{cases}$ Where I_0 is maximum current and the period

2π . Express $i(x)$ as a Fourier series. [8M]

- (b) Find the half-range cosine series for $f(x) = x(2-x)$, in $0 \leq x \leq 2$ and hence

find sum of the series $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots \quad [8M]$

Mid Semester Examination

Year: 2013

Semester: Odd

Course Name: CHEMISTRY

Duration: 1 hour 30 mins

July-Dec 2013

Dept: Humanities and Sciences

Course Code: CY100

Max. Marks: 50

Instructions: Answer all the questions

1. What is decomposition potential? How is it determined? What is its significance?

(1 + 2 + 2) M

2. Explain the followings with proper chemical equation

a. Phosphate conditioning.

b. Hot soda lime process

c. Carbonate conditioning

(2 + 3 + 2) M

3. Describe the following

a. Demineralization of water by ion-exchange method.

(4 + 3) M

b. Desalination by electrodialysis

4. A sample of water is found to contain 40.5 mg/L of $\text{Ca}(\text{HCO}_3)_2$, 46.5 mg/L of $\text{Mg}(\text{HCO}_3)_2$,

27.6 mg/L of MgSO_4 , 32.1 mg/L of CaSO_4 . Calculate the temporary hardness, permanent hardness of water in term of CaCO_3 . [Given: At Wt. Ca = 40, Mg = 24, C = 12, S = 32, O = 16, H = 1]

(4) M

5. Two silver electrodes dipped in AgNO_3 and two aluminum electrodes dipped in $\text{Al}(\text{NO}_3)_3$ are connected in series. How many grams of silver and aluminum will get deposited when a current of 2 ampere strength is passed for 20 minutes? (Note: Molar mass of Ag and Al are 108 and 27 g/mol)

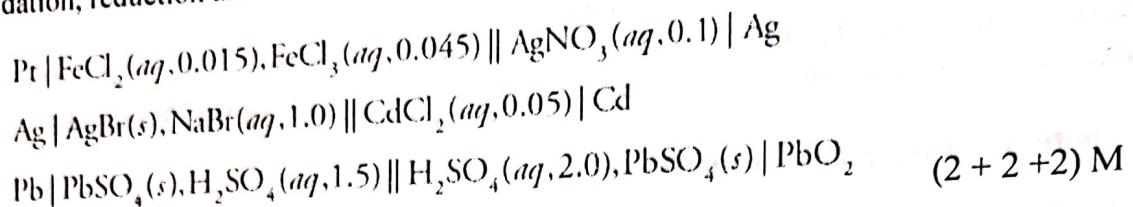
(4)M.

6. The emf of the following cell decreases during discharge. Show with appropriate equation how the change in concentration of Zn^{2+} and Cu^{2+} in solution can explain the decrease in the voltage. Give half-cell and complete cell reaction also (Note: $E^\circ (\text{Cu}^{2+}/\text{Cu}) > E^\circ (\text{Zn}^{2+}/\text{Zn})$)

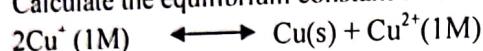


(4) M

7. Identify the anode and cathode for the following electrochemical cells, and write the oxidation, reduction and over all cell reaction



8. Calculate the equilibrium constant for the disproportionation reaction at 25°C



Given: $E^\circ(\text{Cu}^+/\text{Cu}) = +0.52\text{V}$; $E^\circ(\text{Cu}^{2+}/\text{Cu}^+) = +0.16\text{V}$ (5) M

9. Describe hydrogen oxygen fuel cell (5) M

10. Can we stir 1 M CuSO₄ solution with nickel spatula/rod? Justify your answer with appropriate reaction. Given: $E^\circ(\text{Cu}^{2+}/\text{Cu}) = 0.34\text{V}$; $E^\circ(\text{Ni}^{2+}/\text{Ni}) = 0.025\text{V}$ (3) M

-----ALL THE BEST -----

Mid Semester Examination Feb 2013

Course Name: Engineering Mathematics-II Course Code: MA101

Date: 22.02.13 Time: 02.30 P.M-04.00 PM Duration: 90 mins Max. Marks:50

Instructions: Answer all questions:

- Assume suitable data wherever necessary.
- Give precise answer for all the questions.
- Draw relevant diagrams in each question.

$$5 \times 10 = 50$$

1) a) Change the order of integration in $\int_0^a \int_{a-\sqrt{a^2-y^2}}^{a+\sqrt{a^2-y^2}} xy \, dx \, dy$ and hence evaluate it.

b) If $\mathbf{u}(t)$ is a vector which is constant in magnitude, prove that $\frac{d\mathbf{u}}{dt}$ is perpendicular to \mathbf{u} .

2) a) Evaluate $\iint \frac{x^2y^2}{x^2+y^2} \, dx \, dy$ over the annular region between the circles $x^2 + y^2 = a^2$ and $x^2 + y^2 = b^2$ ($b > a$) by transforming into polar co-ordinates.

b) Prove that $\operatorname{div}(\vec{r} \times \vec{a}) = -2\vec{a}$, where \vec{a} is a constant vector.

3) a) Evaluate the area bounded by the parabolas $y^2 = 4 - x$ and $y^2 = 4 - 4x$ as a double integral.

b) Prove that $\operatorname{div}(r^n \vec{r}) = (n+3)r^n$. Deduce that $r^n \vec{r}$ is Solenoidal iff $n=-3$.

4) a) If $\vec{F} = (2x^2 - 3z)\hat{i} - 2xy\hat{j} - 4x\hat{k}$, evaluate $\iiint \nabla \times \vec{F} \, dV$ over V , the region bounded by $x=0, y=0, z=0$ and $2x+2y+z=4$.

b) If $\vec{F} = (x+2y+az)\hat{i} + (bx-3y-z)\hat{j} + (4x+cy+2z)\hat{k}$ is irrotational, find the constants a, b, c .

5) a) Evaluate $\int_0^1 \int_0^{\sqrt{1+x^2}} \frac{dx \, dy}{1+x^2+y^2}$.

b) Evaluate $\iint \vec{F} \cdot \hat{n} \, dS$ over S , the surface of the cube bounded by $x=0, x=1, y=0, y=1, z=0$ and $z=1$, if $\vec{F} = 4xz\hat{i} - y^2\hat{j} + yz\hat{k}$.

****** ALL THE BEST *****

Roll no							
---------	--	--	--	--	--	--	--

NATIONAL INSTITUTE OF TECHNOLOGY GOA
[Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.]

Mid Semester Examination
Course Name: Elements of Mechanical engineering

February 2013

Course Code: ME 100

Branch: A&B

Year: I

Date: 20/02/2013 Time: 2.30 – 4PM

Duration: 1.5Hr

Max. Marks: 50

Instructions: Answer All Questions

1. a) Explain the working of a four – stroke petrol engine with neat sketch 3
 b) What are the advantages and disadvantages of a two stroke engine over a four stroke engine 2
2. a) Distinguish between spark ignition engine and compression ignition engine 3
 b) What are the undesirable emissions from IC engines and what are the major causes of these emissions? 2
3. Explain the following 5
 - a) carburetors
 - b) Turbo charging and super charging
 - c) EGR(exhaust gas recycling)
 - d) Catalytic converter
 - e) CRDI and MPFI
4. a) What are the ideal properties for a refrigerant? 2
 b) Mention any four refrigerants that are commonly used. 1
 c) Name any three refrigeration cycle 1
5. a) Explain vapor compression refrigeration system with neat diagrams? 4
 b) Why the reversed Carnot cycle executed with in the saturation dome is not a realistic model for refrigeration cycle? 2
6. a) What are the applications of refrigeration and air conditioning 3
 b) What are the classifications of compressors? 2
7. a) What are the classifications of hydraulic pumps? 3

		2
b)	Difference Between Pump, Fan, Blower, Compressor	1
c)	What are the main parts of centrifugal pump?	3
8.	a) Distinguish between positive-displacement pump and Dynamic pump	2
	b) Write the expressions for head rise, power delivered to the fluid and efficiency of a pump.	2
9.	Explain cavitation and Net Positive Suction Head (NPSH)	2
	What are main parts of Pelton Wheel and Francis turbine	5
10.	Explain the principle of impulse and reaction water turbines and their characteristics	



Roll no								
---------	--	--	--	--	--	--	--	--

NATIONAL INSTITUTE OF TECHNOLOGY GOA
[Farmagudi, Ponda, Goa - 403 401]

Mid-Sem. Exam

Course Name: Elements of Electrical Engineering

Date: 18-02-2013

Duration: 1Hr 30min

February 2013

Course Code: EE100

Max. Marks: 50M

Instructions:

- a) Attempt all Questions.
- b) Solutions to the Problems deserve proper steps, neat circuit diagrams (where ever it requires) and numerical should have 4 digits after decimal point.

Following questions (1 to 10) carry 2M each and all to be answered in sequence at a place.

1. List the elements of Electrical engineering along with their circuit symbols?
2. Electric circuits are complex for analysis. List the circuit laws, according to you, which make circuits easier for analysis. Explain any one of the law?
3. What mean Linearity and Non linearity nature of a Circuit element ?
4. Define Voltage and Current?
5. What are the limitations of Thevenins theorem ?
6. (a). Every home's electrical circuit will have a fuse. What is the use of the fuse?
(b). Among AC and DC, Which Power Supply we receive in our homes?
7. (a). What is the minimum amount of current that causes man to death?
(b). Electrical technicians, before the work, wear high thickness footwear made of rubber (or) leather. Why?
8. (a). Abbreviate AC, DC?
(b). Which is dangerous among AC and DC?
9. (a). Among AC and DC which is storables?
(b). Mobile Phones, Laptops, UPS's, automobiles makes use of Battery. What are the units in which battery capacity is measured?
10. Give two important applications of electricity to the mankind?

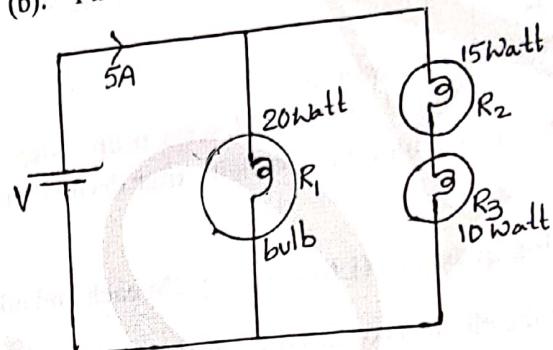
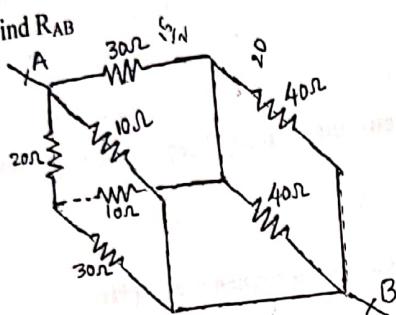
11. Climate Change is to-day's task to take up. According to you, "Whether, Electrical Engineering is contributing to Climate Change". Yes or No and how? Explain 5M

Q.12&Q13 demand proper steps, simplified circuits, formulae used as part of the solution.

10M

(b). Find V , R_1 , R_2 , R_3 ?

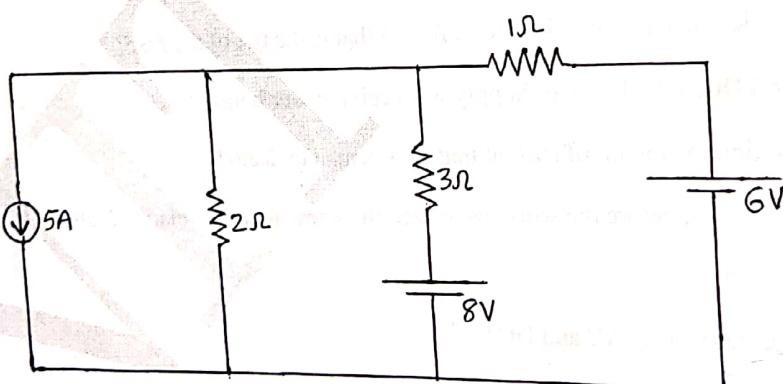
12. (a). Find R_{AB}



15M

13. Find current in the 2Ω resistor by

- (a). Mesh analysis
- (b). Nodal analysis
- (c). Thevenin's theorem



Mid Semester Examination, September 2013

Course Name: Physics
Date: 17.09.2013

Time: 9.30 -11.00 hrs

Course Code: PH100
Max. Marks: 50

Instructions:

1. Answer all the questions
2. Sub questions of a main question must be answered in same sequence at one place.

1. (a) Calculate the energy difference between the first and second quantum states of a free electron in a solid cube (Consider a free electron in a metallic cube with each side of 1 meter) (6M)

(b) What is the significance of the fact that Planck's constant is numerically very small? If it was not so small, our everyday experience of light might be different, Explain How (3M)

(c) Show that the wavelength of a 150 g rubber ball moving with a velocity of 50 m/s is short enough to be determined. (2M)
2. (a) Derive the equation for the momentum and energy of a particle in a one-dimensional box with impenetrable walls, for n=1 and n=2. Assume that potential energy is zero. (10M)

(b) What is the physical significance of ψ and $|\psi|^2$? Derive the Schrödinger time-independent wave equation. (6M)

(c) Consider a particle moving in a one-dimensional potential box of infinite height of 25×10^{-10} meter width. Estimate the probability of finding the particle with an interval of 5×10^{-10} meter at the center of the box when it is in its state of least energy. (6M)
3. a) Describe the Davisson-Germer and G.P Thompson Experiments to demonstrate the wave nature of a particle. (8M)

b) X-Rays of 0.5 Å are scattered by the electrons in a block of carbon through 90° . Find the wavelength of scattered photon. (4M)
4. Compare the salient features of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics (5M)

***All the best ***

Sem II / MA

Roll no									
---------	--	--	--	--	--	--	--	--	--

NATIONAL INSTITUTE OF TECHNOLOGY GOA
[Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.]

Mid Semester Examination SEP 2012

Course Name: Engineering Mathematics

Course Code: MA100

Date: 24.09.12

Time: 02.00 P.M.-03.30 PM

Duration: 90 mins

Max. Marks: 50

Instructions: Answer all questions:

- Assume suitable data wherever necessary.
- Give precise answer for all the questions.
- State the relevant formulae used in each question before answering.

PART -A

8×4=32

- 1) Determine whether the series $\left[\frac{2^2}{1^2} - \frac{2}{1}\right]^{-1} + \left[\frac{3^3}{2^3} - \frac{3}{2}\right]^{-2} + \left[\frac{4^4}{3^4} - \frac{4}{3}\right]^{-3} + \dots$ is convergent or divergent by using Cauchy's root test.
- 2) State a condition which is necessary but not sufficient for convergence.
Hence show that the series $\frac{1}{1+2^{-1}} + \frac{2}{1+2^{-2}} + \frac{3}{1+2^{-3}} + \frac{4}{1+2^{-4}} \dots$ is divergent.
- 3) Examine for convergence the series whose n^{th} term is $\sin \frac{1}{n}$ using comparison test.
- 4) Prove that $2y_1y_3 = 3y_2^2$ if $y = \frac{ax+b}{cx+d}$.
- 5) If $x=\sin t$ and $y=\cos mt$, prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} + (m^2 - n^2)y_n = 0$
- 6) Show that the constant c of Cauchy's mean value theorem for the functions $\sin x$ and $\cos x$ in (a, b) is the arithmetic mean between a and b . ($0 < a < b$).
- 7) Expand $\log(1+\sin x)$ in powers of x upto the term containing x^4 .
- 8) Expand $\tan x$ about the point $x=\pi/4$ upto the third degree terms and hence find $\tan 46^\circ$.



PART -B

 $3 \times 6 = 18$

9) Test for convergence the series $\frac{2}{1^2}x + \frac{3^2}{2^3}x^2 + \frac{4^3}{3^4}x^3 + \dots$ by using appropriate test.

10) a) Show that $D^n[(x^2 - 1)^n] = (2n)!$

b) If $y = \sin^3 x$, find y_n .

11) Obtain Maclaurin's expansion of the function $\log(1+x)$ and hence deduce

that $\log \sqrt{\frac{1+x}{1-x}} = x + \frac{x^3}{3} + \frac{x^5}{5} + \dots$

**** ALL THE BEST ***



Tc S₁ yn

Roll no											
---------	--	--	--	--	--	--	--	--	--	--	--

National Institute of Technology Goa

Farmagudi, Ponda, Goa 403 401

Programme Name: B.Tech

Mid Semester Examinations, September-2016

Course Name: Physics

Date: 22.09.2016

Duration: 1 Hour and 30 minutes

Course Code: PH100

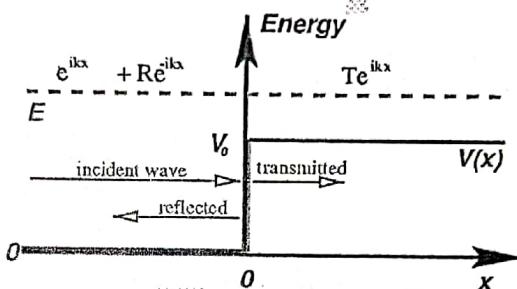
Time: 9.30-11.00

Max. Marks: 50

ANSWER ALL QUESTIONS

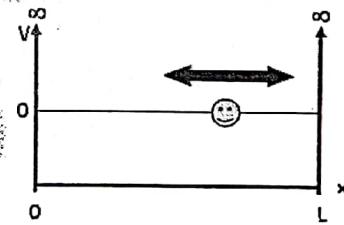
1. Particle of total energy E is moving in a one dimensional potential step is given by (8M)

$$V(x) = 0 \text{ for } x < 0$$
$$V(x) = V_0 \text{ for } x > 0$$



Calculate the reflection and transmission coefficients for $E > V_0$. Where E is the total energy of the particle.

2. A particle is confined in an infinite one-dimensional well of length L (10 M)



- a) Show that the wave function of the particle is $\psi_n(x) = \sqrt{\frac{2}{L}} \sin\left(\frac{n\pi x}{L}\right)$ and energy of the same particle is $E_n = \frac{n^2 h^2}{8mL^2}$
- b) An electron is confined to move between two rigid walls separated by 10^{-9} m. Find the de-Broglie wavelength representing the first three allowed energy states of the electron and the corresponding energies.
3. Compare the uncertainties in the velocities of an electron and a proton confined to a 10^{-10} m width of the one-dimensional box. (5 M)
4. In Quantum Mechanics, what is the difference between group velocity (V_g) and phase velocity (V_p) of matter wave? How can it also be that phase velocity of matter wave is always exceeds the speed of light? (5 M)

5. Calculate the uncertainty in the momentum of a proton which is confined to a nucleus of radius equal to 10^{-13} cm. From this result, estimate the kinetic energy of the proton inside the nucleus and the strength of the nuclear interaction. What would be the kinetic energy of an electron if it had to be confined within a similar nucleus? (6 M)
6. Why Compton Effect and Photoelectric effects are an evidence for the particle nature of electromagnetic radiation? (5 M)
7. The normalized wave function for certain particle is $\Psi(x) = \sqrt{\frac{3}{\pi}} \cos x$, $-\frac{\pi}{2} < x < \frac{\pi}{2}$. Calculate the probability of finding the particle between $0 < x < \frac{\pi}{4}$ (5 M)
8. If a beam of electrons impinges on any energy barrier of height 0.25 eV and of infinite width, find the fraction of electrons reflected and transmitted at the barrier if the energy of impinging electrons is: (i) 0.30 eV (ii) 0.20 eV and (iii) 0.25 eV. (6 M)

ALL THE BEST

Ist yr

Roll no									
---------	--	--	--	--	--	--	--	--	--

National Institute Of Technology Goa

Farmagudi, Ponda, Goa 403 401

Programme Name: B. Tech
Mid Semester Examinations - 2016

Course Name: Engineering Mechanics
Date: 22/09/2016
Duration: 90 min

Course Code: ME 100
Time: 02.00 -3.30pm
Max. Marks: 50

ANSWER ALL QUESTIONS

1. a) The screw eye is subjected to two forces, $F_1 = 3\text{kN}$ towards North and $F_2 = 5\text{kN}$ Northeast. Determine, the magnitude and direction of the resultant force (i) graphically (ii) analytically.

b) Find the magnitude of the two forces, such that if they act at right angles, their resultant is $\sqrt{10} \text{ N}$. But if they act at 60° , their resultant is $\sqrt{13} \text{ N}$.

c) The forces 20 N, 30 N, 40 N, 50 N and 60 N are acting at one of the angular points of a regular hexagon, towards the other five angular points, taken in order. Find the magnitude and direction of the resultant force. (4+3+5=12 Marks)

2. a) The man shown in Figure 1 pulls on the cord with a force of 70 lb. Represent this force acting on the support A as a cartesian vector and determine its direction.

b) Determine the magnitude and direction of the couple moment about point "o" for the cases shown in Figure 2 and Figure 3. (3+4 =7 Marks)

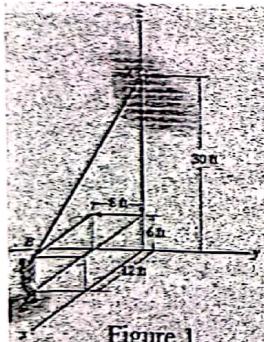


Figure 1

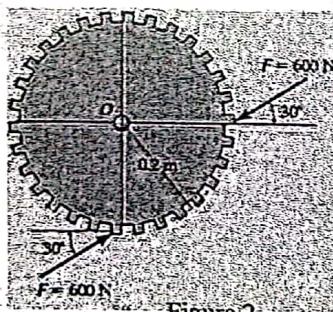


Figure 2

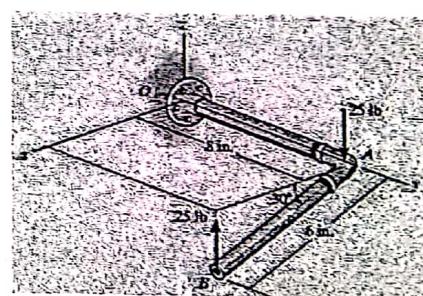


Figure 3

3. The frame supports the 400kg load in the manner shown in Figure 4. Neglect the weights of the members compared with the forces induced by the load and compute the horizontal and vertical components of all forces acting on each of the members. (8 Marks)

4. Determine the reactions at A and B for the beam (Figure 5) subjected to the uniform load distribution.

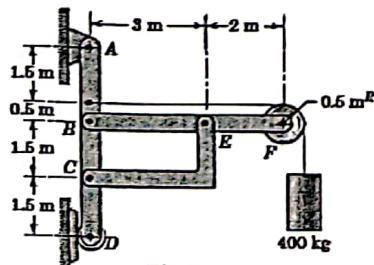


Figure 4

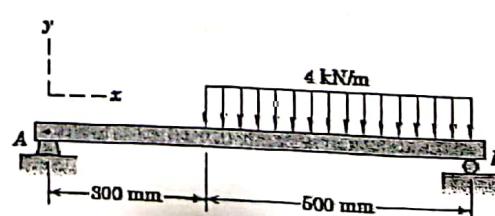


Figure 5

(6 Marks)

(P.T.O)

5. A cantilever beam of 1.5m long is loaded with a uniformly distributed load of 2 kN/m run over a length of 1.25 m from the free end. It also carries a point load of 3 kN at a distance of 0.25m from the free end. (8 Marks)

Draw the shear force and bending moment diagrams of the cantilever.

6. An inclined plane as shown in Figure 6 used to unload slowly a body weighing 400 N from a truck 1.2 m high into the ground. The coefficient of friction between the underside of the body and the plank is 0.3. What minimum force is required parallel to the plane for this purpose? (5 Marks)

7. A semicircular area is removed from a trapezium as shown in Figure 7 (dimensions in mm). Determine the centroid of the shaded area. (5 Marks)

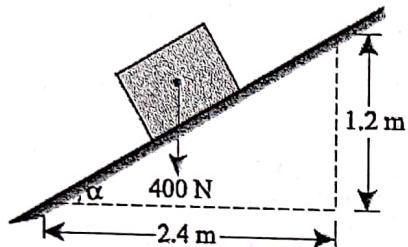


Figure 6

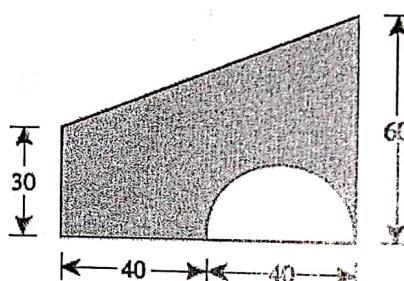


Figure 7

I^cyn

Roll no											
---------	--	--	--	--	--	--	--	--	--	--	--

National Institute of Technology Goa

Programme Name: B.Tech

Mid Semester Examinations, September-2016

Course Name: Computer Programming and Problem Solving

Course Code: CS100

Date: 21-09-2016

Time: 2.00 P.M- 3.30 P.M

Duration: 1 Hour 30 minutes

Max. Marks: 50

ANSWER ALL QUESTIONS

1a. What will be the output of following program? Explain.

```
#include <stdio.h>
int main ()
{ int a = 2, b = 7, c = 10;
  c = a == b;
  printf ("%d", c);
  return 0;
}
```

PS_Q1a_1

```
#include <stdio.h>
int main ()
{
  int x = 100, y = 20, z = 5;
  printf ("%d %d %d", i);
  return 0;
}
```

PS_Q1a

```
#include <stdio.h>
int main ()
{
  int i=1;
  for (i = 0; i = -1; i = 1)
  {printf ("%d ", i);
   if (i != 1) break;
  }
  return 0;
}
```

PS_Q1a_3

```
#include <stdio.h>
int main ()
{
  int i;
  for (i = 0; i <= 5; i++)
  printf (" %d", i);
  return 0;
}
```

PS_Q1a_4

1b. Give the general structure of C Program. Also, explain each component of it. (5+5)**2a.** Write a program to reverse a given string.

Hint: Accept input string character by character. If given input is HAI 123, expected output is 321 IAH.

2b. Write a program to compute the sum of the digits of a given number.

Hint: If the given number 1234 then its digits sum is 10 (i.e., 1+2+3+4). Use array construct. (5+5)

3a. What are bitwise operators? Explain. Also, write a function *setbits(x, p, n, y)* that returns *x* with the *n* bits that begin at position *p* set to the rightmost *n* bits of *y*, leaving the others unchanged.**3b.** Explain the general syntax of an *Else-If* statement. Write a function to compute the binary search. (5+5)**4a.** Write a program to compute and display the sum of all integers that are divisible by 6 but not divisible by 4 and lie between 0 and 50. The program should also count and display the numbers of such values.**4b.** Explain the general form of a *For* statement with necessary example.**4c.** What is the importance of an *void* statement. Give the different forms of a *void* statement. (4+3+3)**5a** What is the output of the following program segments:

```
main ( )
{
  int m[ ] = {1.2.3.4.5};
  int x, y = 0;
  for (x = 0; x < 5; x++)
    y = y + m[x];
  printf ("%d", y);
}
```

PS_Q5a_1

```
main ( )
{
  char string[ ] = "HELLO WORLD";
  int m;
  for (m = 0; string [m] != '\0'; m++)
  if (m%2 == 0)
    printf ("%c", string[m]);
}
```

PS_Q5a_2

```
main ( )
{
  int m = 100, n = 0;
  while (n == 0)
  { if (m < 10)
    break;
    m = m - 10;
  }
}
```

PS_Q5a_3

Page 1 of 2

```
main()
{ char x; int y;
  x = 100; y = 125;
  printf("%c\n", x);
  printf("%c\n", y);
  printf("%d\n", x)
}
```

PS_Q5a_4

```
for (m = 0; m < 3; ++m)
  printf("%d\n", (m%2)? m: m+2);
```

PS_Q5a_6

5b. What is the error, if any in the following program segment:

```
int x = 0;
float y = 4.25;
x = y % x;
```

PS_Q5b_1

5c. Write scanf statements to read the following data list:

- i. 78, TRUE, B
- ii. 1.23, 45A, 21-09-2016

(5+1+4)

-----ALL THE BEST-----

Internal Assessment

Minor: 2

FM: 25

Time: 1hr n 15 Mins

Date: 20/10/2014

Q1. As the Purchase Officer of Pigeon Pvt Ltd, you had ordered 12 dozen bed sheets after examining the sample sent by the wholesaler. When the consignment arrives you find neither in texture nor in shades do the sheets conform to the samples you had approved. Write a complaint letter demanding their replacement. (6)

Q2. Imagine that you are the Assistant Registrar of NIT, Goa. Write a letter to Sai Hospitality, Panjim whether it can provide food for a staff dinner of 25 members or not. Invent the necessary details. (6)

Q3. As a Manager of Sai Hospitality, you reply accordingly to the Asst. Registrar of NIT, Goa quoting the rates of various food items and other charges. (6)

Q4. As a Secretary of Assurgent Technology, write the Minutes of the 7th meeting of Board of Governors held on 10/10/2014. Assume the Agenda as stated below: (7)

- Confirmation of the Minutes of the last meeting
- Waste Disposal
- Theft
- Biometric Attendance for Employees

Date: 31/10/201

Question Paper for Defaulters

Q1. Compare and Contrast Verbal and Non Verbal Communication. 7

Q2. Write a Note on Proxemics. 8

Q3. Define Minutes. As a Secretary of Sygenta prepare the Minutes of the meeting of BoG held on 20/10/2014. Assume the following Agenda:

- Parking Problem
- Maintenance of non-consumable Assets
- Preparation of Annual Report

3+7=10

Q4. As a Production Manager of your company, write a letter of Sales Promotion to promote the new sedan Volkswagen Car to your valued customers. 8

Q5. Write a short note on Noise. 7

NB: Q.1 & Q.2 are meant for Minor 1 F.M. 15

All the Questions combine Minor 1 & 2 F.M. 25

**Programme Name: B.Tech/M.Tech/Ph.D
End Semester Examination November 2014**

Course Name: Professional Communication

Course Code: HU 100

Date: 26/11/2014

Time: 10 a.m.-1.p.m.

Max. Marks: 100

Instructions: Don't break the sequence, while answering the questions.

(Group A)

Q1. Make a Précis of the following content and give a suitable title. (8+2=10)

The argument has been triggered off by the new definition of a planet. If we are to accept it, the solar system would instantly be boosted to twelve planets, including one large and round asteroid, which is a brother of the far away icy Pluto. The main source of the problem is that the International Astronomical Union (IAU), which is in-charge of categorizing objects in space, can define everything from an asteroid to a star, but cannot give a proper definition of a planet. It is the recent discoveries in present times that have highlighted the IAU's inadequacy of defining a planet.

Scientists are now trying to come up with a formal definition of a planet. For instance, Giber Barsi at California University feels that there are at least a dozen known planets right now. He also points out that there is also the problem of classifying the huge objects found orbiting around the stars. Many of the astronomers feel that Pluto should never have been called a planet in the first place. Since, it is smaller than the earth's moon and its width is only 1,430 miles. This body travels along an elongated orbit. The controversy regarding Pluto started growing by late 1999 when scientists started noticing Kuiper belt objects (KBO) whose size approached the size of Pluto.

Some astronomers question the fact that if a Kuiper belt object as big as Pluto discovered, then what will it be so called? Will it get the status of the 10th planet? So many people started insisting that Pluto should receive "unilateral demotion". In fact, right from Pluto's discovery by Lowell, controversy has dogged the planet. It was first stated to be larger than the Earth. Later on, it turned out to be much smaller than the Earth. It was only a few years back that scientists had turned a blind eye to Pluto's "crashing into the planetary party". It was in 2007, when a celestial body larger than Pluto was discovered by the astronomer Mike Brown. The orbit of this planet stretched even beyond Neptune. Professor Brown named the rock Xena and claimed it to be the 10th planet of the solar system. Officially Xena has been called "UB313".

(Group B)

1. Prepare a User Manual of a LG Washing Machine. (8)
2. "Communication is Situation-Bound", elucidate this statement in the context of effective communication. (8)
3. Write a short note on "Empathy". (8)
4. What is Proxemics? Why is it important in a Professional set up? Justify your suggestions logically. (8+6=14)
5. The Volkswagen Group of Panjim is going organize a Car Fair at Miramar on 1/12/2014. Prepare a press content on behalf of the company. (8)
6. The McDonald's Fast Food Corporation wishes to open an outlet in Ponda. As an Operation Manager of the company, write a Report to the M.D. of McDonald's regarding the feasibility of the project. (12)
7. Write a letter of complaint against the LED television that you have bought from SONY Showroom of Panjim. (8)
8. As a Director of Syngenta, you have observed that the employees use the office copier and the landline for personal use. Write a Memo to warn them against this practice. (6)
9. Prepare a Résumé of your own for a position of Operation Research Analyst in Tech Mahindra. (8)
10. As a Secretary of Philips, write the Minutes of 10th Board Meeting held on 12/11/2014 at the conference hall of the head office. Assume the agenda:
- Production
 - Yearly Turnover
 - Export Policies
 - Ex gratia
 - CSR Scheme

(10)

End- Semester Examination November- 2012

CY100: Chemistry

I - Semester, Sec-A
Time - 10.00 AM -1.00 PM

Max. Marks - 100

Date: 27/11/2012
Duration - 3 hrs.

Instructions: 1. All the questions are compulsory
2. Use pensile to draw diagram whenever it required.

1. a) What is meant by reverse osmosis? Explain the purification of water by reverse osmosis. b) Explain the softening of water by zeolite process. (5 + 5) M
2. a) Explain Czochralski crystal pulling technique. b) Give four important applications each of: i. Nano Carbon ii. Nano-ZnO iii. Nano-TiO₂ (4 + 6) M
3. Write the monomers used in making, repeating units and two uses of the following a. Teflon b. Plexiglass c. UF d. SBR e. Silicone (5 x 2 = 10) M
4. a) Explain why natural rubber needs Compounding. How is it carried out? b) What are the factors affecting Glass transition temperature? (2 + 5 + 3) M
5. a) The *e.m.f* of a cell Mg / Mg²⁺ (0.01 M) // Cu²⁺ (C₁) / Cu is measured to be 2.78V at 298K. Calculate the electrode potential of copper (E_{Cu}) electrode. $E^{\circ}_{Mg^{2+}/Mg} = -2.371$ V. b) Justify that "Zinc displaces hydrogen from acid but Copper does not". (5 + 2) M
6. Write short note on: a) Types of Electrodes. b) Lead-Acid battery. (4 + 4) M
7. What is electroless plating? Discuss the electroless plating copper on PCB? (2 + 8) M
8. Differentiate the following
 - a. Colorimetry and Spectrophotometry.
 - b. Qualitative and Quantitative analysis (5 + 5) M
9. Define Cracking. What is the necessity of cracking? Explain fluidized bed catalytic cracking. (1 + 2 + 4) M
10. Write a note on: a) Biodiesel b) Hydrogen as a source of energy. (4 + 4) M
11. Explain what type of corrosion occurs when a) Screw and washer are made of different metals, b) Presence of NaOH in mild steel boiler under stress.
 - c) Write note on Galvanic series. (3 + 3 + 4) M

-----All The Best-----



End Semester Examination**November 2012****Course Name: Physics****Course Code: PH100****Date: 27.11.2012****Time: 10.00 -1.00****Max. Marks: 100****Instructions:**

- 1. Answer all the questions**
- 2. Sub questions of a main question must be answered in same sequence at one place.**
Otherwise invalid for correction.

1.(a) Draw the Energy band diagram for a pn-junction diode in an unbiased condition and proved that the equilibrium contact potential V_o across the junction is given by

$$V_o = \frac{kT}{e} \ln \left(\frac{n_n}{n_p} \right) \text{ where } V = \frac{kT}{e}, N_1 = \text{concentration of donor atoms, } N_2 = \text{concentration of acceptor atoms, } n = \text{intrinsic density}$$

(7M)

b) A sample of Intrinsic Germanium at room temperature has a carrier concentration of $2.4 \times 10^{19}/\text{m}^3$. It is doped with antimony at a rate of one antimony atom per million atoms of Germanium. If the concentration of the Germanium atoms is $4 \times 10^{28}/\text{m}^3$, determine the hole- concentration. (3M)

2. a) What is Hall effect? Give expression for each of the following

1. Hall coefficient
2. Hall voltage
3. Hall angle
4. Hall mobility

And Mention some applications of Hall effect.

(7M)

b) An n-type Germanium sample has a donor density of $10^{21}/\text{m}^3$. It is arranged in a hall experiment having magnetic field of 0.75 T and the current density is 500 A/m^2 . Find the Hall voltage if the sample is 3 mm wide. (3M)

3. (a) Explain Electronic, Orientation and Ionic polarization in dielectric materials (7M)

b) The atomic weight and density of Sulphur are 32 and 2.08 gm/cm^3 respectively. The electric polarizability of the atom is $3.28 \times 10^{-40} \text{ F.m}^2$. If Sulphur solid has cubical symmetry, what will be its relative dielectric constant. (3M)

4. (a) Explain how optical fibers are classified. Discuss their characteristic features.

(4M)

b) Compare the salient features of Maxwell-Boltzmann, Bose-Einstein and Dirac statistics with the help of suitable equations.

Fermi-
(12M)

- 5.(a) Explain with neat diagram the process of absorption of light, spontaneous emission and stimulated emission of light. What are the necessary conditions for their occurrence? (5M)
- b) Explain the principle and working of Ruby laser. (5M)
6. (a) Discuss the failures of classical Physics and how does quantum mechanics overcame these failures. (5M)
- b) What is the significance of the fact that Planck's constant is numerically very small? if it was not so small, our everyday experience of light might be different, Explain How (5M)
- c) Show that the wavelength of a 150 g rubber ball moving with a velocity of 50 m/s is short enough to be determined. (2M)
7. (a) State Heisenberg's uncertainty principle and use it to prove the non-existence of electron inside the nucleus. (9M)
- b) Explain Schrödinger wave equation. What is the physical significance of wave function ψ . (2M)
- c) Derive expression for Schrödinger time dependent and time independent equations. (2M)
- 8.(a) A particle moves in a one dimensional potential whose function is given by:
 $V(x)=0, x < 0$ and $V(x)=V_0$ for $x > 0$
Write down the Schrödinger wave equation for the particle and find its solution. Find the reflection and transmission coefficients for $E > V_0$ and $E < V_0$, where E is the total energy of the particle. (8M)
- b) If a beam of Electrons impinges on any energy barrier of height 0.25 eV and of infinite width, find the fraction of electrons reflected and transmitted at the barrier if the energy of impinging electrons is (i) 0.30 eV (ii) 0.20 eV (iii) 0.25 eV. (5M)

All the best

End Semester Examination

November 2012

Course Name: Transformers and Induction Machines

Course Code: EE206 *3*

Date: 26/11/2012

Duration: 3 hours

Max. Marks: 100

Instructions:

1. Answer all the questions.
2. Mention question number clearly before writing the answer.

1. A) Explain fully about the transformer on load condition. (Neat phasor diagrams and neat equivalent circuit diagrams are required). (10M)

b) Explain clearly about double revolving field theory. (10M)

2. The following results were obtained from OC and SC tests on 8 kVA 400/120V, 50 Hz transformer.

OC Test: 120V; 4 A; 75W.

SC Test: 9.5V; 20A; 110W.

Calculate:

i) The equivalent circuit constants. (8M)

ii) Voltage regulation and efficiency for 0.8 lagging power factor load. (6M)

iii) The efficiency at half full load 0.8 power factor load. (6M)

3. What are the type of connections available in 3-Φ transformer explain them in detail with proper circuit diagram and notations and compare them. (16M+4M)

4. Explain all types of 1-Φ Induction motors clearly and compare them. (20M)

5. A 400V, 11kW, 3-phase, 50Hz, 4 pole delta connected induction motor gave the following test data:

No load test : 400V, 8A, 1000W

Locked rotor test : 100V, 25A, 1750W

Construct the circle diagram and determine

i) Full load current and power factor

ii) Maximum power output

iii) Full load slip

iv) Maximum torque in N-m

v) Maximum power input and output

vi) Slip for maximum torque

vii) Full load Rotor copper losses

viii) No-load losses and frictional losses

ix) Maximum power factor

x) Motor efficiency

(2×10=20M)



End Semester Examination

Nov 2012

Course Name: Engineering Mathematics

Course Code: MA100

Date: 26.12.12

Time: 10.00 A.M-01.00 PM

Duration: 3 Hrs

Max. Marks: 100

Instructions: Answer all questions:

- Assume suitable data wherever necessary.
- Give precise answer for all the questions.
- State the relevant formulae used in each question before answering.

$10 \times 10 = 50$

1) a) Discuss the convergence of the series $\frac{1}{1^2} + \frac{1}{2^{3/2}} + \frac{1}{3^{4/3}} + \frac{1}{4^{5/4}} + \dots$ using comparison test.

b) Expand $e^{\sin x}$ upto terms containing x^4 .

2) a) If $I_n = \frac{d^n}{dx^n}(x^n \log x)$, prove that (i) $I_n = nI_{n-1} + (n-1)!$

$$\text{(ii)} I_n = n! \left[\log x + 1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n} \right].$$

b) If $x = a \left\{ \cos t + \frac{1}{2} \ln \left(\tan^2 \frac{t}{2} \right) \right\}$ and $y = a \sin t$, then find $\frac{d^2y}{dx^2}$.

3) a) If $u = \ln(x^3 + y^3 - x^2y - xy^2)$ then show that $u_x + u_y = \frac{2}{x+y}$ and hence prove that $u_{xx} + 2u_{xy} + u_{yy} = \frac{-4}{(x+y)^2}$.

b) If Z is a function of x and y , and $x = e^u + e^{-y}$ and $y = e^{-u} - e^x$ prove that $\frac{\partial Z}{\partial u} - \frac{\partial Z}{\partial y} = x \frac{\partial Z}{\partial x} - y \frac{\partial Z}{\partial y}$.

4) a) If $u = \sin^{-1} \left[(x^2 + y^2)^{1/5} \right]$ prove that $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = \frac{2}{25} \tan u (2 \tan^2 u - 3)$ using Euler's theorem.

b) Write degree of homogeneous function $u = \operatorname{cosec}^{-1} \left[\frac{x^{1/2} + y^{1/2}}{x^{1/3} + y^{1/3}} \right]^2$.

5) a) Show that the normal at any point (r, θ) to the curve makes an angle 4θ with initial line for the curve $r^3 = a^3 \cos 3\theta$.



b) Determine the radius of curvature and centre of curvature of the folium $x^3 + y^3 = 3axy$ at the point $P\left(\frac{3a}{2}, \frac{3a}{2}\right)$.

6) a) Expand $f(x, y) = \tan^{-1}\left(\frac{y}{x}\right)$ in the neighborhood of $(1, 1)$ upto third degree terms. Hence compute $f(1.1, 0.9)$ approximately.

b) If $PV^2 = K$ and if the relative error in P is 0.05 and in V is 0.025, find the error percentage in K .

7) a) Examine the function $\sin x + \sin y + \sin(x+y)$ for extreme values.

b) Find $\frac{\partial(u,v)}{\partial(x,y)}$ if $u = \frac{x+y}{1-xy}$ and $v = \tan^{-1}x + \tan^{-1}y$.

8) a) Using reduction formula, evaluate $\int_0^\infty \frac{1}{(1+x^2)^5} dx$

b) Evaluate $\int_0^1 \frac{x^{\alpha-1}}{\log x} dx$, ($\alpha \geq 0$) using differentiation under integral sign where α is the parameter. Hence find $\int_0^1 \frac{x^3-1}{\log x} dx$.

9) Find the Fourier series of $f(x) = \begin{cases} 0 & -\pi < x < 0 \\ \sin x & 0 < x < \pi \end{cases}$. Hence deduce that

$$\frac{1}{1 \times 3} + \frac{1}{3 \times 5} + \frac{1}{5 \times 7} + \dots = \frac{1}{2}$$

10) a) If $f(x) = x$ is defined in $-l < x < l$ with period $2l$, find the Fourier expansion of $f(x)$.

b) Trace the curve $x^3 + y^3 = 3axy$.

***** ALL THE BEST *****

Roll no							
---------	--	--	--	--	--	--	--

NATIONAL INSTITUTE OF TECHNOLOGY GOA
[Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.

End Semester Examination

April-May 2013

Course Name: Professional Communication

Course Code:HU100

Branch:

Semester:II

Date:04/05/13

Time: 9.30-12.30p.m

Duration:3 Hrs

Max. Marks:50

Instructions: All Questions are compulsory.

1. Write a PRECIS of the following passage in about one-third of its length. Suggest a suitable title also.

“Education is not an end but a means to an end. In other words, we do not educate children only for the purpose of educating them; the purpose is to make them fit for life. As soon as we realize this fact, we will understand that it is very important to choose a system of education which will really prepare children for life.

In many modern countries it has for sometime been fashionable to think that, by free education for all – whether rich or poor, clever or stupid – one can solve all the problems of society and build a perfect nation. But we can already see that free education for all is not enough: we find in such countries a far larger number people with university degrees than there are jobs for them to fill. Because of their degrees, they refuse to do what they think “low” work; and, in fact, work with the hands is thought to be dirty and shameful in such countries.

But we have only to think a moment to understand that the work of a completely uneducated farmer is far more important than that of a professor; we can live without education, but we die if we have no food. If no one cleaned our streets and took the rubbish away from our houses, we would get terrible diseases in our towns.

In fact, when we say that all of us must be educated, we mean that all of us must be educated in such a way that first, each of us can do whatever job is suited to

his brain and ability, and, secondly, that we can realize that all jobs are necessary to society, and that it is very bad to be ashamed of one's work, or to scorn someone else's. Only such a type of education can be called valuable to society." (About 315 words) **25 Marks**

2. "Your Success or Failure in life will depend, largely upon your Skills and Ability to Express your Ideas". Write a detailed, comprehensive Essay on this topic, keeping in mind the Communication Skills you have learned in the Class. **25 Marks**

3. Explain in detail (a) Memorandum
(b) Minutes
(c) Agenda
(d) Notice

20 Marks

4. What is a Group Discussion ? Explain the concept of Group Discussion in detail, its importance and relevance in professional life.

15 Marks

5. Write short notes on:

(a) Conferences
(b) Reports
(c) Professional Communication

15 Marks

Programme Name: B.Tech
End Semester Examination, April 2015

Course Name: Basic Electrical Science
Date: 28-04-2015

Time: 02:00 pm-5:00 pm

Course Code: EE151
Max. Marks: 100

1. When connected to a $230 \text{ V}_{\text{rms}}$, 50 Hz source, a load absorbs 4 kW at a lagging power factor of 0.8. Find the value of capacitance required to raise the power factor to 0.95? (6 marks)

2. A bar of Silicon has a length of 1 cm and cross sectional area of 1 mm^2 . At 300 K, Si has 5×10^{28} atoms/ m^3 and an intrinsic concentration of $1.5 \times 10^{16} \text{ m}^{-3}$. The free electron and hole mobilities are $0.13 \text{ m}^2/\text{V}\cdot\text{s}$ and $0.05 \text{ m}^2/\text{V}\cdot\text{s}$ respectively. The bar is doped with 2 parts per 10^8 of an acceptor impurity. Determine (a) the conductivity (b) the resistance of the resulting p-type semiconductor bar (6 marks)

3. Find out the average and instantaneous power drawn by a balanced star connected three phase load having per phase resistance of $R \Omega$. The load is supplied by a balanced three phase star connected source having phase voltage (v_{an}) equal to $V_p \sin \omega t$. If a single phase resistive load of $R \Omega$ is connected between phase 'a' and neutral, determine the average and instantaneous power drawn. (6 marks)

4. Draw the circuit diagram of a half wave rectifier. Determine the value of the filter required to meet following load specifications, output voltage = V_{dc} , output voltage ripple = V_r , and load resistance = R_L (6 marks)

5. For the circuit given in Fig. 1 $V_{BB}=3 \text{ V}$, $V_{CC}=10 \text{ V}$, and $\beta=100$. Find R_B and R_C such that the transistor is biased in the active region at $I_C=2.3 \text{ mA}$ and $v_{CE}=5.4 \text{ V}$? Draw the load line. (6 marks)

6. For the RL circuit given in Fig. 2, determine $i(t)$. (8 marks)

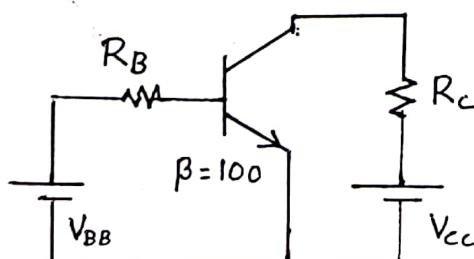


Fig. 1

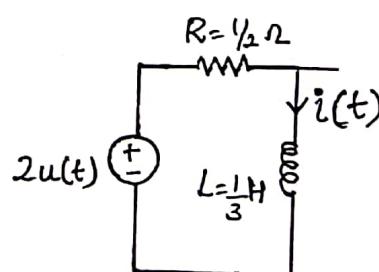
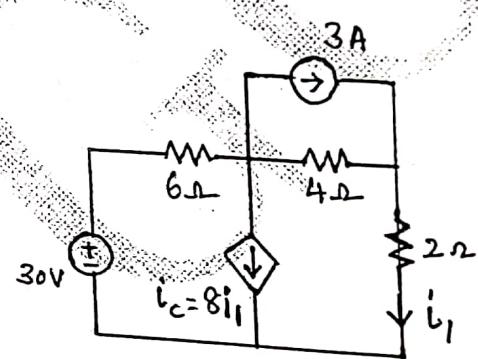
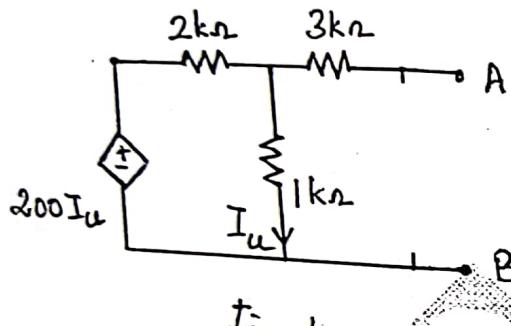


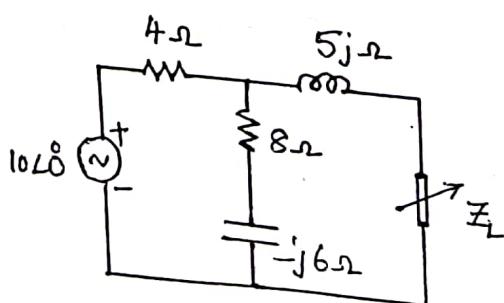
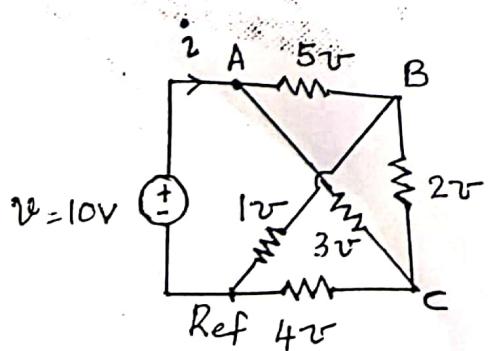
Fig. 2

Equivalent circuit of the network given in Fig. 4 seen across terminals A and B (8 marks)



10. Use Nodal analysis to determine the conductance ($G = i/v$) loading the source given in Fig. 5. (8 marks)

11. Determine the load impedance Z_L that maximizes the average power drawn from the circuit of Fig. 6. What is the maximum average power? (10 marks)



12. For the circuit given in Fig.7:

- (a) Determine the state of the diode (forward or reverse biased) and the output voltage when (i) $i_i=1\text{A}$, and (ii) $i_i=2\text{A}$.
 (b) Plot i_i vs. t and v_o vs. t , if $i_i=2\sin\omega t \text{ A}$

(10 marks)

13. The switch in Fig.8 is moved from A to B at $t=0$ after being placed at A for a long time. This places the two capacitors in series, thus allowing equal and opposite voltages to be trapped in the capacitors. Find:

- (a) $v_1(0-), v_2(0-)$ and $v_R(0-)$
 (b) $v_1(0+), v_2(0+)$ and $v_R(0+)$
 (c) the time constant of the system
 (d) $v_R(t)$ for $t>0$
 (e) $v_1(t)$ for $t>0$.

(10 marks)

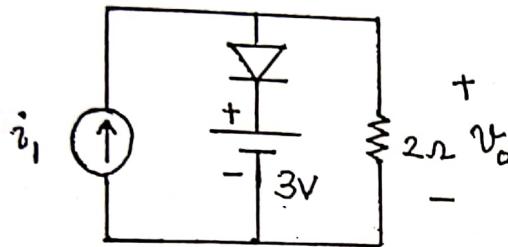


Fig. 7

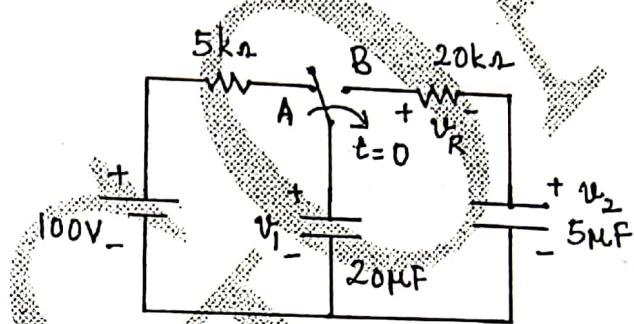
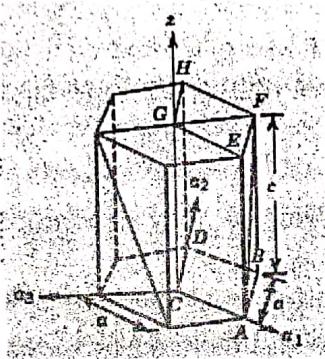


Fig. 8

1. a) Draw the following Miller Planes and Directions of the unit cell.
- (i) Planes: [210], [110], [231], [101] and (ii) Directions: $\bar{1}00$ and $1\bar{1}\bar{1}$. (6M)
- b) The spacing between the principle planes in sodium chloride crystal is 2.82 \AA . It is found that the first order Bragg reflection of a monochromatic beam of X-rays occur at an angle of 10° . (a) What is the wavelength of X-rays? (b) At what angle would be second order reflection occur? (4M)
- c) Determine the Miller-Bravais indices for the plane shown in the hexagonal unit cell. (4M)



d) If the average energy required to produce a Frenkel defect in an ionic crystal is 1.4 eV . Find out the ratio of the number of Frenkel defects at 20°C and 300°C in one gram of the crystal. (4M)

2. a) Calculate the Fermi energy of sodium at 0K assuming that it has one free electron per atom and density of sodium is 970 kg/m^3 and atomic weight is 23. (3M)
- b) Discuss the Kronig-Penney model for the motion of an electron in a periodic potential and derive an expression for the density of energy states and carrier concentration in a solid material (Metal) by using Fermi distribution function. (7M)
- c) Show that the probability of finding an electron of energy ΔE above the Fermi level is same as probability of not finding an electron at energy ΔE below the Fermi level. (4M)
- d) In a Hall co-efficient experiment, a current of 0.25 Amp is sent through a metal strip having thickness 0.2 mm and width 5 mm. The Hall voltage is found to be 0.15 mv when a magnetic field of 2000 gauss is used. (a) What is carrier concentration (b) What is the drift velocity of carrier. (3M)

P. T. O.

Page 1 of 2

3. a) Derive the expression $n = (2N_D)^{1/2} \left[\frac{2\pi m_e k T}{h^2} \right]^{3/4} \exp \left[\left(\frac{E_D - E_C}{2kT} \right) \right]$ for majority carrier concentration in n-type semiconductor at low temperatures. (5M)
- b) Draw the energy band diagrams of extrinsic semiconductors (n-type & p-type) at temperatures 0 K and 300K. (3M)
- c) What fraction of the conductivity of intrinsic silicon at room temperature is due to (a) electrons and holes? The electron and hole mobilities are $0.135 \text{ m}^2/\text{v.s}$ and $0.048 \text{ m}^2/\text{v.s}$ respectively. (4M)
- d) The resistivity ρ of the two sides of an abrupt germanium diode are $2\Omega \text{ cm}$ on p-side and $1\Omega \text{ cm}$ on n-side. Calculate the height of the potential energy barrier at room temperature. [$n_i = 2.25 \times 10^{18}/\text{cm}^3$, $\mu_e = 3800 \text{ cm}^2/\text{V.s}$ $\mu_h = 1800 \text{ cm}^2/\text{V.s}$ and $k = 1.38 \times 10^{-23} \text{ J/K}$] (4M)
- e) i) Explain the operation of p-n-p transistor and ii) In an n-p-n transistor circuit, the collector current is 15 mA. If 95% of the electrons emitted by the emitter reach the collector, what is the base current? (6M)
4. a) A sphere of radius 'a' is polarized along the radius vector such that $\vec{P} = P_0 \vec{r}$. Determine ρ , σ , total charge, \vec{D} and \vec{E} (4M)
- b) Consider an electron of charge ' $-e$ ' moving in a circular orbit of radius 'a' about a charge ' $+e$ ' in a field directed at right angles, to the plane of the orbit. Show that the polarizability α is approximately $4\pi\epsilon_0 a^3$. (4M)
- c) Derive the Clausius-Mosotti equation for non-polar solids having cubic crystal structure. (5M)
- d) A dielectric material has $\epsilon_r = 4.94$ and $n^2 = 2.69$. Calculate the ratio between electronic and ionic polarizability of this material. (4M)
5. a) What are intrinsically conducting polymers? How they are classified and explain them with an example each. (4M)
- b) Define nanotechnology and explain the effect on physical properties due to nanoscale. (4M)
- c) Write the applications of SEM (Scanning Electron Microscope) and TEM (Transmission Electron Microscope). (3M)
6. a) What is meant by Hysteresis? Explain hysteresis loss. How would you use the hysteresis curves to select material for the construction of permanent magnets? (4M)
- b) A magnetic material has a magnetization of 2300 A/m and produces a flux density of 0.00314 Wb/m^2 . Calculate magnetizing force and relative permittivity of the material. [$\mu_0 = 12.57 \times 10^{-7} \text{ H/m}$] (4M)
- c) What is the significance of critical temperature, critical magnetic field and critical current density for superconductors? Explain Meissner effect. (3M)
- d) Calculate the critical current for a wire of lead having a diameter of 1mm at 4.2 K. The critical temperature for lead is 7.18 K and $H_c(0) = 6.5 \times 10^4 \text{ A/m}$. (4M)
- (4M)

*** All the best ***

**Programme Name: B.Tech/M.Tech/Ph.D
End Semester Examination April, 2015**

**Course Name: Research Methodology
Date: 27/04/2015**

Time: 9:30:a.m.-12:30 p.m.

**Course Code: HU 701
Max. Marks: 100**

Instructions:

- **Don't break the sequence, while answering the questions**
- **Keep (at least two-line) space in between lines while scanning the sonnet**

1. Write short notes on
a. Synopsis, b. Archive, c. Database, d. Citation with examples from MLA 7th Ed, e. Blog
 $(5 \times 4 = 20)$
2. What is a problem statement? What are the different types of research problems? How can they be solved?
 $(6+6+6=18)$
3. What is hypothesis? What are the types? What are the main considerations in formulation of a hypothesis? State them.
 $(7+10+8+10=25)$
4. Define Blank Verse, Run-On Line and Negative Capability with examples. $(4+4+4=12)$
5. Scan the following sonnet. Write the rhyme scheme of it. Find out the different types of rhetoric used in it.
 $(14+6+5=25)$

When I have fears that I may cease to be
Before my pen has glean'd my teeming brain
Before high-piled books, in charact'ry
Hold like rich garners the full-ripen'd grain;

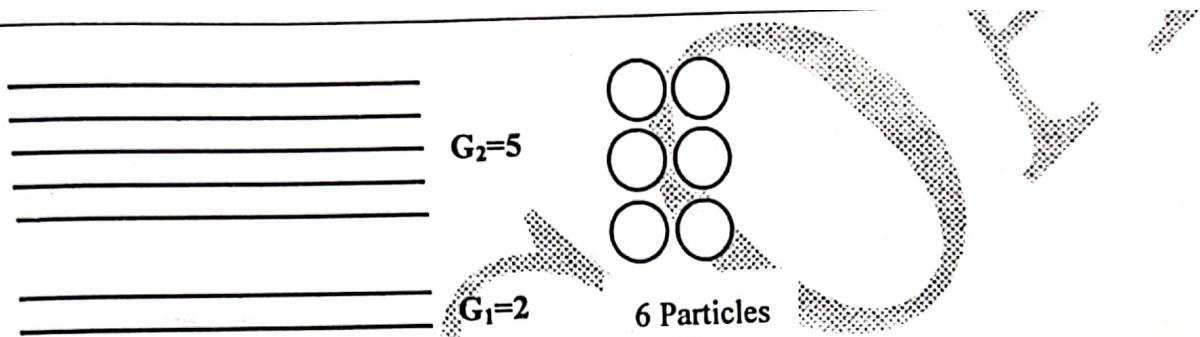
When I behold, upon the night's starr'd face,
Huge cloudy symbols of a high romance,
And to think that I may never live to trace

Their shadows, with the magic hand of chance;

And when I feel, fair Creature of an hour!
That I shall never look upon thee more,
Never have relish in the fairy power
Of unreflecting love--- then on the shore

Of the wide world I stand alone, and think
Till Love and Fame to nothingness do sink.

1. a)



Above figure contains 6 distinguishable particles, 2 energy levels (one with a degeneracy of 2 and the other degeneracy of 5). Calculate the number of Macrostates and microstates in this system. (7M)

- b) Write the most probable microstate for Bose-Einstein statistics and obtain Bose Einstein distribution function in the form $f(E)_{BE} = \frac{1}{e^{\alpha + \beta E} - 1}$. (8M)
- c) State and discuss the behaviour of Fermi-Dirac Distribution function under the following conditions.
- i) $E = 0$.
 - ii) $E \ll \epsilon_f$.
 - iii) $E \gg \epsilon_f$ (ϵ_f is Fermi energy) (7M)

2. a) Assume that the de-Broglie wave associated with a moving electron can form a "standing wave between the atoms arranged in a one-dimensional array with nodes at each of the atomic site. It is found that one such standing wave is formed if the distance D between the atoms of the array is 20 nm. Another standing wave is again formed if D is increased to 25 nm but not for any intermediate value of D. Find the energy of the electrons in eV and the last value of D for which the standing wave of the type described above can form. (6M)

- b) Compare the uncertainties in the velocities of an electron and a proton confined to a 10^{-10} m box. (4 M)

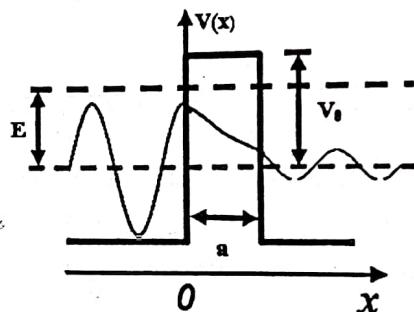
- b) State and explain the Heisenberg's uncertainty principle and using this to find the minimum energy of a Harmonic Oscillator. (8 M)

- c) Ultraviolet light of wavelength 350 nm and intensity 1.00 W/m^2 is directed at a potassium surface. (a) find the maximum kinetic energy of the photoelectrons. (b) if 0.50 percent of the incident photons produce photoelectrons. how many are emitted per second if the potassium surface has an area of 1.00 cm^2 ? (4M)

- d) Why is the Compton Effect an evidence for the particle nature of electromagnetic radiation? (4M)
- e) An electron and a positron are moving side by side in the positive X-direction at $0.5c$ when they annihilate each other. Two photons are produced that move along the X-axis. (a) Do both photons move in the positive X-direction? (b) What is the energy of each photon? (4M)
3. a) Explain how optical fibers are classified. Discuss their characteristic features. (4M)
- b) An optical fiber is 2m long and has a diameter of $20\text{ }\mu\text{m}$. If a ray of light is incident on one end of the fiber at an angle of 40° , how many reflections does it undergo before emerging from the other end? Refractive index of fiber is 1.3. (4M)
- c) Show that the probabilities for stimulated emission and for spontaneous emission are proportional. (4M)
- d) 10 mW He-Ne laser has efficiency of 1% assume that all input energy is utilized in promoting the atoms from ground state to the excited state, which is 20.0 eV above the ground state. Find how many atoms are promoted to the excited state in one second. (4M)

4. a) A particle travelling with energy E along X-axis has a potential barrier defined as

$$\begin{aligned} V(x) &= 0 \text{ for } x < 0 \\ V(x) &= V_0 \text{ for } 0 < x < a \\ V(x) &= 0 \text{ for } x > a \end{aligned}$$



Derive the expression for the reflection and transmission coefficient of the Particle. Where E is the total energy of the particle and a is the width of the barrier. (10M)

- b) If a beam of electrons impinges on any energy barrier of height 0.25 eV and of infinite width, find the fraction of electrons reflected and transmitted at the barrier if the energy of impinging electrons: (i) 0.30 eV (ii) 0.20 eV and (iii) 0.25 eV (5M)
- c) The normalized wave function for certain particle is $\Psi(x) = \sqrt{\frac{3}{\pi}} \cos x$, $-\frac{\pi}{2} < x < \frac{\pi}{2}$. Calculate the probability of finding the particle between $0 < x < \frac{\pi}{4}$ (5M)
5. a) Explain terms: nuclear fusion and fission. What is the source of energy released in these reactions? (4M)
- b) A critical magnetic field of lead wire is $6.5 \times 10^3 \text{ A/m}$ at 0K. At what temperature would the critical magnetic field of lead drop to $4.5 \times 10^3 \text{ A/m}$ if the critical temperature of lead is 7.18K? What is the critical current density at that temperature if the diameter of the wire is $2 \times 10^{-3} \text{ m}$? (4M)
- c) What is the Meissner effect? Explain the Type I and Type II superconductors (4M) (4M)

All the best

Roll No. []



National Institute of Technology Goa

Programme Name: B.Tech End Semester Examination, November-2014

Department of Humanities and Sciences

Course Name: MATHEMATICS-I

Date: November 27, 2014

Duration: 3 Hours

Course Code: MA 100

Time: 10:00 AM

Max. Marks: 100

ANSWER ALL QUESTIONS

- Suppose that $a_n > 0$ for all n and $\sum_{n=1}^{\infty} a_n$ converges. Discuss the convergence or divergence of the series $\sum_{n=1}^{\infty} \sqrt{a_n} \sin(a_n)$. [10M]
- For $a \geq 0$, let $x_1 = a$ and $x_{n+1} = \frac{1}{5}(x_n^2 + 6)$ for all $n \in \mathbb{N}$.
 - Find (all) the values of a in $[0, \infty)$ for which $(x_n)_{n=1}^{\infty}$ is increasing or decreasing.
 - Verify whether the sequence $(x_n)_{n=1}^{\infty}$ converges if $3 < a < \frac{7}{2}$. [5M+5M]
- Let $f : [0, 1] \rightarrow \mathbb{R}$ be a continuous function. Prove that there exists an $\alpha \in [0, 1]$ such that $\int_0^1 f(x)x^2 dx = \frac{1}{3}f(\alpha)$. [10M]
- If f is a continuous function on $[c, d]$ and if $l'_1(x)$ and $l'_2(x)$ exist, where $l'_1(x), l'_2(x) \in [c, d]$ for all x , then prove that

$$\frac{d}{dx} \int_{l_1(x)}^{l_2(x)} f(t) dt = f(l_2(x)) \frac{dl_2(x)}{dx} - f(l_1(x)) \frac{dl_1(x)}{dx}.$$

[10M]

- A. Using $\epsilon - \delta$ definition prove that $\lim_{(x,y) \rightarrow (0,0)} \frac{4xy^2}{x^2 + y^2} = 0$.

B. Discuss the continuity of the following function at origin:

$$f(x, y) = \begin{cases} \frac{x^2 y}{x^4 + y^2} & (x, y) \neq (0, 0) \\ 0 & (x, y) = (0, 0) \end{cases}$$

[5M+5M]

- Using the definition of differentiability, show that the following function is differentiable at origin:

$$f(x, y) = \begin{cases} xy \frac{x^2 - y^2}{x^2 + y^2} & (x, y) \neq (0, 0) \\ 0 & (x, y) = (0, 0) \end{cases}$$

[10M]

7. Find the absolute maximum and absolute minimum values of $f(x, y) = 2 + 2x + 2y - x^2 - y^2$ on the triangular region in the first quadrant bounded by x -axis, y -axis and the line $y = 9 - x$. [10M]
8. Let $f : [0, 12] \rightarrow \mathbb{R}$ be continuous and $f(0) = f(12)$. Using intermediate value property, show that there exist $x_1, x_2, x_3, x_4 \in [0, 12]$ such that $x_2 - x_1 = 6, x_4 - x_3 = 3, f(x_1) = f(x_2)$ and $f(x_3) = f(x_4)$. [10M]
9. Find the quadratic approximation to $f(x, y) = \sin xy$ near the origin and also find the error bound if $|x| \leq 1$ and $|y| \leq 1$. [5M+5M]
10. Evaluate $\int \int (x-y)^4 e^{x+y} dx dy$, over the region R where R is the square with vertices $(1, 0), (2, 1), (1, 2)$ and $(0, 1)$. [10M]

*****ALL THE BEST*****



Programme Name: B.Tech/M.Tech/Ph.D
End Semester Examination November 2014

Course Name: Professional Communication

Course Code: HU 100

Date: 26/11/2014

Time: 10 a.m.-1.p.m.

Max. Marks: 100

Instructions: Don't break the sequence, while answering the questions.

(Group A)

Q1. Make a Précis of the following content and give a suitable title. (8+2=10)

The argument has been triggered off by the new definition of a planet. If we are to accept it, the solar system would instantly be boosted to twelve planets, including one large and round asteroid, which is a brother of the far away icy Pluto. The main source of the problem is that the International Astronomical Union (IAU), which is in-charge of categorizing objects in space, can define everything from an asteroid to a star, but cannot give a proper definition of a planet. It is the recent discoveries in present times that have highlighted the IAU's inadequacy of defining a planet.

Scientists are now trying to come up with a formal definition of a planet. For instance, Giber Barsi at California University feels that there are at least a dozen known planets right now. He also points out that there is also the problem of classifying the huge objects found orbiting around the stars. Many of the astronomers feel that Pluto should never have been called a planet in the first place. Since, it is smaller than the earth's moon and its width is only 1,430 miles. This body travels along an elongated orbit. The controversy regarding Pluto started growing by late 1999 when scientists started noticing Kuiper belt objects (KBO) whose size approached the size of Pluto.

Some astronomers question the fact that if a Kuiper belt object as big as Pluto discovered, then what will it be so called? Will it get the status of the 10th planet? So many people started insisting that Pluto should receive "unilateral demotion". In fact, right from Pluto's discovery by Lowell, controversy has dogged the planet. It was first stated to be larger than the Earth. Later on, it turned out to be much smaller than the Earth. It was only a few years back that scientists had turned a blind eye to Pluto's "crashing into the planetary party". It was in 2007, when a celestial body larger than Pluto was discovered by the astronomer Mike Brown. The orbit of this planet stretched even beyond Neptune. Professor Brown named the rock Xena and claimed it to be the 10th planet of the solar system. Officially Xena has been called "UB313".

(Group B)

1. Prepare a User Manual of a LG Washing Machine. (8)
2. "Communication is Situation-Bound", elucidate this statement in the context of effective communication. (8)
3. Write a short note on "Empathy". (8)
4. What is Proxemics? Why is it important in a Professional set up? Justify your suggestions logically. (8+6=14)
5. The Volkswagen Group of Panjim is going organize a Car Fair at Miramar on 1/12/2014. Prepare a press content on behalf of the company. (8)
6. The McDonald's Fast Food Corporation wishes to open an outlet in Ponda. As an Operation Manager of the company, write a Report to the M.D. of McDonald's regarding the feasibility of the project. (12)
7. Write a letter of complaint against the LED television that you have bought from SONY Showroom of Panjim. (8)
8. As a Director of Syngenta, you have observed that the employees use the office copier and the landline for personal use. Write a Memo to warn them against this practice. (6)
9. Prepare a Résumé of your own for a position of Operation Research Analyst in Tech Mahindra. (8)
10. As a Secretary of Philips, write the Minutes of 10th Board Meeting held on 12/11/2014 at the conference hall of the head office. Assume the agenda:
- Production
 - Yearly Turnover
 - Export Policies
 - Ex gratia
 - CSR Scheme

(10)



Roll no. _____

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa 403 401

Course Name: Engineering Mechanics
Date: 25 Nov 2014
Duration: 3 Hrs

Course Code: ME100
Time: 10 am- 1pm
Max. Marks: 100

ANSWER ALL QUESTIONS

1. A load W of magnitude 600 N is applied to the linkage at B as shown in Fig.1. The constant of the spring, $k = 2.5 \text{ kN/m}$, and the spring is unstretched when AB and BC are horizontal. Neglecting the weight of linkage and knowing that $l = 300\text{mm}$, using the virtual work method, determine the value of θ corresponding to the equilibrium.

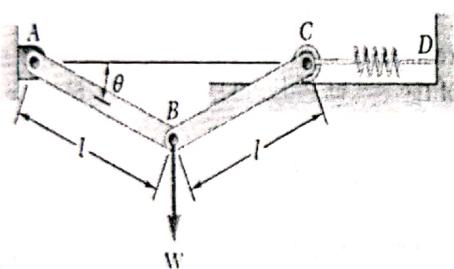


Fig.1

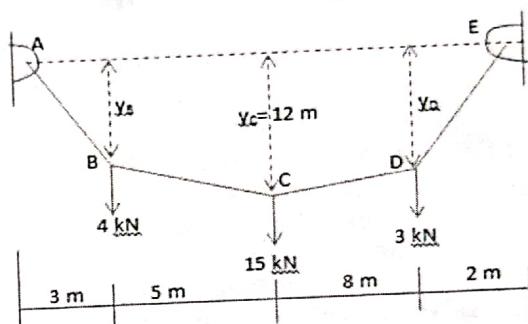


Fig.2

2. A cable is subjected to concentrated loads as shown in Fig.2. Determine (a) the tension in each segment of the cable, (b) slope of each segment, and (c) the sags y_B , y_D .
3. A cantilever beam (fixed at end A and free at other end C) is subjected to the loading as shown in Fig.3. Draw the shear force and bending moment diagrams and determine the maximum and minimum (absolute) values of shear force and bending moment and their locations.

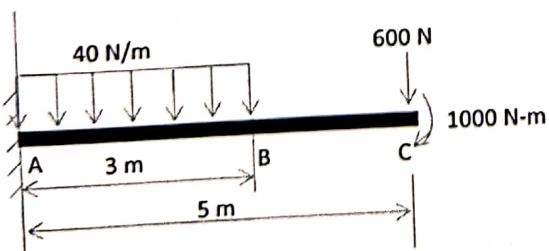


Fig.3

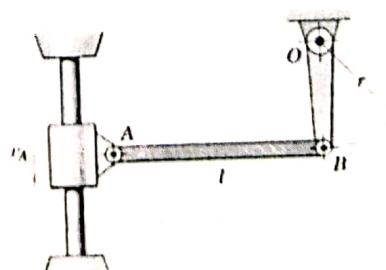


Fig.4

4. The sliding collar moves up and down the shaft, causing an oscillation of crank OB as shown in Fig.4. If the velocity of A is not changing as it passes the null position where AB is horizontal and OB is vertical, determine the angular acceleration of OB in that position.
5. The members CJ and CF of the loaded truss cross but are not connected to members BI and DG. See Fig.5. Using the method of sections, compute the forces in members BC, CJ, CI, and HI.

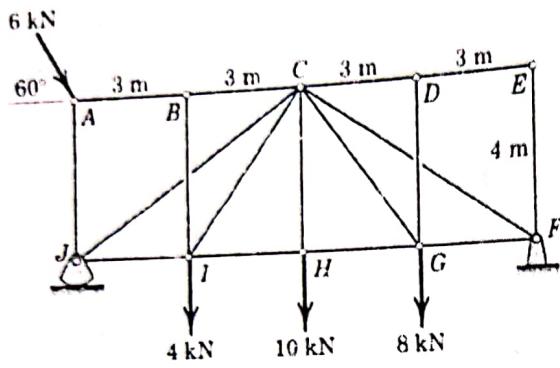


Fig. 5

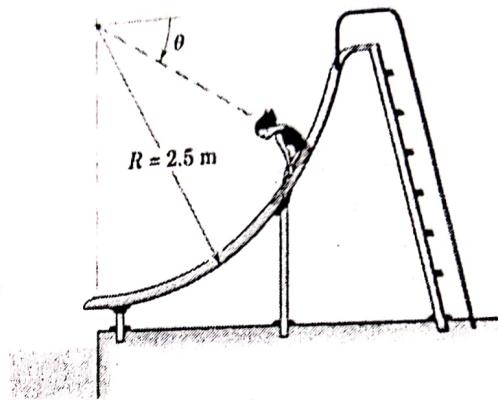


Fig. 6

6. Beginning from rest when $\Theta = 20^\circ$, a 35 kg child slides with negligible friction down the sliding board which is in the shape of a 2.5 m circular arc as shown in Fig.6. Determine the tangential acceleration and speed of the child, and the normal force exerted on her (a) when $\Theta = 30^\circ$ and (b) when $\Theta = 90^\circ$.
7. Determine the centroid, first and second moment of area with respect to x-axis, of the shaded area shown in Fig. 7.

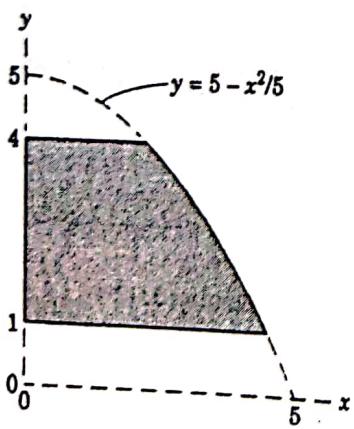


Fig. 7

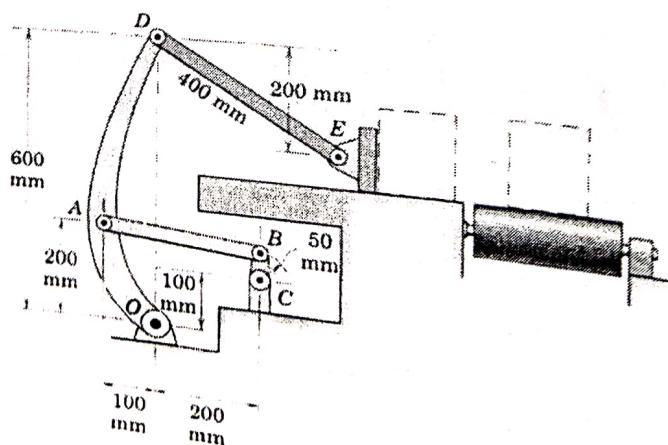


Fig. 8

8. A mechanism for pushing small boxes from an assembly line onto a conveyor belt is shown with arm OD and crank CB in their vertical positions as shown in Fig.8. The crank revolves clockwise at a constant rate of 1 revolution every 2 seconds. For the position shown, determine the speed at which the box is being shoved horizontally onto the conveyor belt.

9. The slotted arm is pivoted at O and carries the slider C as shown in Fig.9. The position of C in the slot is governed by the cord which is fastened at D and remains taught. The arm turns counterclockwise with a constant angular rate of 4 rad/sec during an interval of its motion. The length DBC of the cord equals R, which makes $r=0$ when $\theta=0^\circ$. The distance $R=375\text{mm}$. Determine the magnitude a of the acceleration of the slider at the position for which $\theta=30^\circ$.

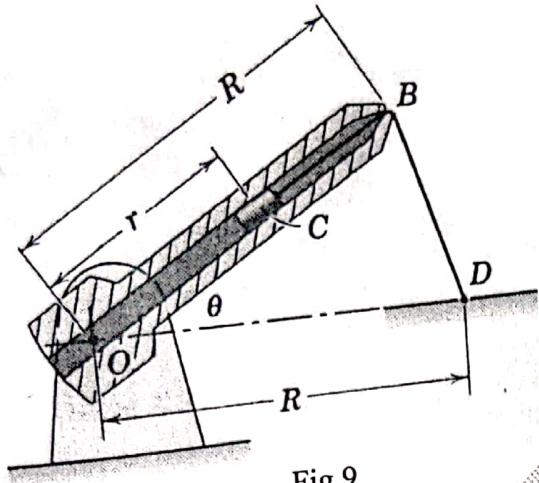


Fig.9

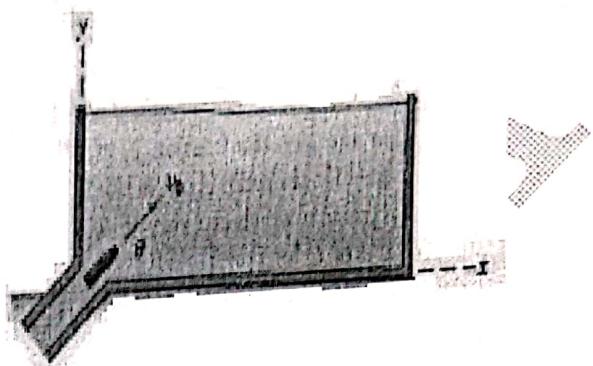
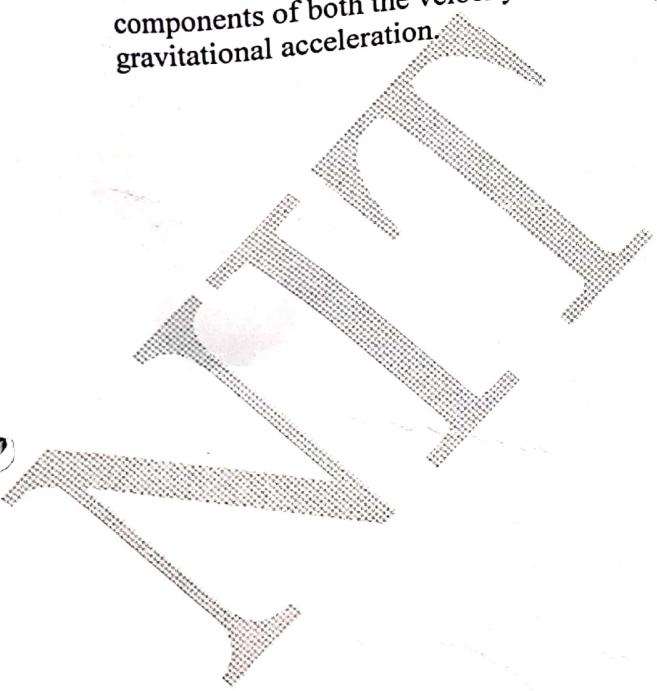


Fig. 10

10. A projectile is ejected into an experimental fluid at time $t=0$ as shown in Fig.10. The initial speed is $v_0=100 \text{ m/s}$ and the angle to the horizontal is $\Theta=45^\circ$. The drag on the projectile results in an acceleration term $a_D = -0.5v$, where v is the velocity of the projectile. Determine the x- and y-components of both the velocity and displacement when time $t=2$ seconds. Include the effects of gravitational acceleration.





Roll no _____

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa 403 401

Programme Name: B.Tech
End Semester Examination, November-2014
Course Name: Computer Programming and Problem Solving
Date: 24/11/2014
Duration: 3 hours

Course Code: CS100
Time: 10:00 AM - 01:00 PM
Max. Marks: 100

ANSWER ALL QUESTIONS

- Q. 1) a) Which symbols are used in hexadecimal system? Find the hexadecimal equivalent of following binary numbers: i) 1011 ii) 1110101111 iii) 10110101. (3 marks)
- b) Find the decimal equivalents of the following hexadecimal numbers: i) AE.6FC ii) D123.AB iii) EFF.3DA. (3 marks)
- c) What are the different types of data? Give an example of each of these data types. (3 marks)
- Q. 2) a) Define the terms: algorithm, programming language and computer program. (3 marks)
- b) What is a compiler? What is the difference between an interpreter and a compiler? (3 marks)
- c) Briefly explain following types of programming languages: i) Assembly language, ii) high level language. Which type of language is C language? (3 marks)
- Q. 3) a) A company manufactures three products: engines, pumps and fans. It gives a discount of 10% on orders for engines if the order is for Rs. 5000 or more. The same discount of 10% is given on pump orders of value Rs. 2000 or more and on fan orders for Rs. 1000 or more. On all other orders they do not give any discount. Obtain a decision table corresponding to this word statement. (6 marks)
- b) Fifteen pairs of coordinates of points in a plane are given. Write an algorithm to find the number of points in each of the 4 quadrants in a plane (For example, the pair <-3, 6> is in the second quadrant. (6 marks)
- Q. 4) a) Read the following program and explain what it does. Trace it with n = 10. (4 marks)
- ```
#include<stdio.h>
int main()
{
 int n, first = 0, second = 1, next, c;
 scanf("%d", &n);
 for (c = 0 ; c < n ; c++)
 {
 if (c <= 1) next = c;
 else
 {
 next = first + second;
 first = second;
 second = next;
 }
 printf("%d\n", next);
 }
}
```

- Q. 1)   
 b) Pick the incorrect type declarations from the following list. Explain why they are incorrect. (2 marks)
- i) float, servo, mass, iota;
  - ii) int servo, digit, count;
  - iii) int rs.ps, unsigned;
  - iv) float real, root, big;
- c) Classify the following constants as decimal, octal or hexadecimal. (3 marks)
- i) 0234 ii) -0456 iii) 0xAB56 iv) -468734689 v) -0x38 vi) 22
- Q. 5) a) Find the value of a in each of the following statements: (4 marks)
- ```

int i = 5, j = 5, k = 7;
float a = 3.5, b = 5.5, c = 2.5;
i) a = b - i/j + c/j
ii) a = (b - 1)/(j + c) / j
iii) a = b + 1 % 1 + c
iv) a = (b + 1) % (1 + c)

```
- b) Write printf statements to print the following: (4 marks)
- i) int a, b, c
 - ii) float x, y, z
 - iii) unsigned int a, b, c
 - iv) float p, q, r in exponent format.
- c) Write scanf statement to read two negative integers and three floating point numbers. (3 marks)
- Q. 6) a) Given the base and height of a right angled triangle write a program to find its area. (4 marks)
- b) Given a point (x,y) write a program to find out whether it lies inside, outside or on a circle with radius z and center at (0, 0). (6 marks)
- Q. 7) a) Compare while, do-while and for loops in C. Give an example of each. (4 marks)
- b) Given a set of integers, write a program to find those which are palindromes. E.g. the number 123321 is a palindrome as it reads the same from left to right and from right to left. (6 marks)
- Q. 8) a) Write a program to find the sum of squares of elements on the diagonal of a square matrix. (6 marks)
- b) Write a program to find if a square matrix is symmetric. (5 marks)
- Q. 9) a) Given the date an employee joined a job in the firm: Day/Month/Year and given today's date, write a program to find out whether the given joining date of an employee is a legal date. E.g. a date such as 10/14/81 is illegal as the month cannot exceed 12. (5 marks)
- b) Write a C program using function that given x, calculates the value of function f(x) defined below: (6 marks)
- | | |
|-------------------------|-------------|
| $f(x) = 2x^2 + 3x + 4$ | for $x < 2$ |
| $f(x) = 0$ | for $x = 2$ |
| $f(x) = -2x^2 + 3x - 4$ | for $x > 2$ |
- Q. 10) a) Explain the difference in 'passing by value' and 'passing by reference' with example. (6 marks)
- b) Write a C program that uses a function called interchange to swap values of two numbers using no: approach. (4 marks)

Annexure-I

Potentials in Alphabetical Order

Reduction half-reaction	E° (V)	Reduction half-reaction	E° (V)
$\text{Ag} + \text{e}^- \rightarrow \text{Ag}$	+0.80	$\text{In}^{2+} + \text{e}^- \rightarrow \text{In}^+$	-0.40
$\text{Ag}^{2+} + \text{e}^- \rightarrow \text{Ag}^+$	+1.98	$\text{In}^{3+} + \text{e}^- \rightarrow \text{In}^{2+}$	0.49
$\text{AgBr} + \text{e}^- \rightarrow \text{Ag} + \text{Br}^-$	+0.07	$\text{In}^{3+} + 2 \text{e}^- \rightarrow \text{In}^+$	-0.44
$\text{AgCl} + \text{e}^- \rightarrow \text{Ag} + \text{Cl}^-$	+0.22	$\text{In}^{3+} + 3 \text{e}^- \rightarrow \text{In}$	-0.34
$\text{AgF} + \text{e}^- \rightarrow \text{Ag} + \text{F}^-$	+0.78	$\text{K}^+ + \text{e}^- \rightarrow \text{K}$	-2.93
$\text{AgI} + \text{e}^- \rightarrow \text{Ag} + \text{I}^-$	-0.15	$\text{La}^{3+} + 3 \text{e}^- \rightarrow \text{La}$	-2.52
$\text{Al}^{3+} + 3 \text{e}^- \rightarrow \text{Al}$	-1.66	$\text{Li}^+ + \text{e}^- \rightarrow \text{Li}$	-3.05
$\text{Au}^+ + \text{e}^- \rightarrow \text{Au}$	+1.69	$\text{Mg}^{2+} + 2 \text{e}^- \rightarrow \text{Mg}$	-2.36
$\text{Au}^{3+} + 3 \text{e}^- \rightarrow \text{Au}$	+1.40	$\text{Mn}^{2+} + 2 \text{e}^- \rightarrow \text{Mn}$	-1.18
$\text{Ba}^{2+} + 2 \text{e}^- \rightarrow \text{Ba}$	-2.91	$\text{Mn}^{3+} + \text{e}^- \rightarrow \text{Mn}^{2+}$	+1.51
$\text{Be}^{2+} + 2 \text{e}^- \rightarrow \text{Be}$	-1.85	$\text{MnO}_2 + 4 \text{H}^+ + 2 \text{e}^- \rightarrow \text{Mn}^{2+} + 2 \text{H}_2\text{O}$	+1.23
$\text{Bi}^{3+} + 3 \text{e}^- \rightarrow \text{Bi}$	+0.20	$\text{MnO}_4^- + \text{e}^- \rightarrow \text{MnO}_4^{2-}$	+0.56
$\text{Br}_2 + 2 \text{e}^- \rightarrow 2 \text{Br}^-$	+1.09	$\text{MnO}_4^{2-} + 8 \text{H}^+ + 5 \text{e}^- \rightarrow \text{Mn}^{2+} + 4 \text{H}_2\text{O}$	+1.51
$\text{BrO}_3^- + \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{Br}^- + 2 \text{OH}^-$	+0.76	$\text{MnO}_4^{2-} + 2 \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{MnO}_2 + 4 \text{OH}^-$	+0.60
$\text{Ca}^{2+} + 2 \text{e}^- \rightarrow \text{Ca}$	-2.87	$\text{NO}_3^- + 2 \text{H}^+ + \text{e}^- \rightarrow \text{NO}_2 + \text{H}_2\text{O}$	+0.80
$\text{Cd}^{2+} + 2 \text{e}^- \rightarrow \text{Cd}$	-0.40	$\text{NO}_3^- + 4 \text{H}^+ + 3 \text{e}^- \rightarrow \text{NO} + 2 \text{H}_2\text{O}$	+0.96
$\text{Cd(OH)}_2 + 2 \text{e}^- \rightarrow \text{Cd} + 2 \text{OH}^-$	-0.81	$\text{NO}_3^- + \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{NO}_2^- + 2 \text{OH}^-$	+0.01
$\text{Ce}^{3+} + 3 \text{e}^- \rightarrow \text{Ce}$	-2.48	$\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$	-2.71
$\text{Ce}^{4+} + \text{e}^- \rightarrow \text{Ce}^{3+}$	+1.61	$\text{Ni}^{2+} + 2 \text{e}^- \rightarrow \text{Ni}$	-0.23
$\text{Cl}_2 + 2 \text{e}^- \rightarrow 2 \text{Cl}^-$	+1.36	$\text{Ni(OH)}_3 + \text{e}^- \rightarrow \text{Ni(OH)}_2 + \text{OH}^-$	+0.49
$\text{ClO}^- + \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{Cl}^- + 2 \text{OH}^-$	+0.89	$\text{O}_2 + \text{e}^- \rightarrow \text{O}_2^-$	-0.56
$\text{ClO}_4^- + 2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{ClO}_3^- + \text{H}_2\text{O}$	+1.23	$\text{O}_2 + 4 \text{H}^+ + 4 \text{e}^- \rightarrow 2 \text{H}_2\text{O}$	+1.23
$\text{ClO}_4^- + \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{ClO}_3^- + 2 \text{OH}^-$	+0.36	$\text{O}_2 + \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{HO}_2^- + \text{OH}^-$	-0.08
$\text{Co}^{2+} + 2 \text{e}^- \rightarrow \text{Co}$	-0.28	$\text{O}_2 + 2 \text{H}_2\text{O} + 4 \text{e}^- \rightarrow 4 \text{OH}^-$	+0.40
$\text{Co}^{3+} + \text{e}^- \rightarrow \text{Co}^{2+}$	+1.81	$\text{O}_3 + 2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{O}_2 + \text{H}_2\text{O}$	+2.07
$\text{Cr}^{2+} + 2 \text{e}^- \rightarrow \text{Cr}$	-0.91	$\text{O}_3 + \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{O}_2 + 2 \text{OH}^-$	+1.24
$\text{Cr}_2\text{O}_7^{2-} + 14 \text{H}^+ + 6 \text{e}^- \rightarrow 2 \text{Cr}^{3+} + 7 \text{H}_2\text{O}$	+1.33	$\text{Pb}^{2+} + 2 \text{e}^- \rightarrow \text{Pb}$	-0.13
$\text{Cr}^{3+} + 3 \text{e}^- \rightarrow \text{Cr}$	-0.74	$\text{Pb}^{4+} + 2 \text{e}^- \rightarrow \text{Pb}^{2+}$	+1.67
$\text{Cr}^{3+} + \text{e}^- \rightarrow \text{Cr}^{2+}$	-0.41	$\text{PbSO}_4 + 2 \text{e}^- \rightarrow \text{Pb} + \text{SO}_4^{2-}$	-0.36
$\text{Cs}^+ + \text{e}^- \rightarrow \text{Cs}$	+0.52	$\text{Pt}^{2+} + 2 \text{e}^- \rightarrow \text{Pt}$	+1.20
$\text{Cu}^+ + \text{e}^- \rightarrow \text{Cu}$	+0.34	$\text{Pu}^{4+} + \text{e}^- \rightarrow \text{Pu}^{3+}$	+0.97
$\text{Cu}^{2+} + 2 \text{e}^- \rightarrow \text{Cu}$	+0.15	$\text{Ra}^{2+} + 2 \text{e}^- \rightarrow \text{Ra}$	-2.92
$\text{Cu}^{2+} + \text{e}^- \rightarrow \text{Cu}^+$	+2.87	$\text{Rb}^+ + \text{e}^- \rightarrow \text{Rb}$	-2.93
$\text{F}_2 + 2 \text{e}^- \rightarrow 2 \text{F}^-$	-0.44	$\text{S} + 2 \text{e}^- \rightarrow \text{S}^{2-}$	-0.48
$\text{Fe}^{2+} + 2 \text{e}^- \rightarrow \text{Fe}$	-0.04	$\text{SO}_4^{2-} + 4 \text{H}^+ + 2 \text{e}^- \rightarrow \text{H}_2\text{SO}_3 + \text{H}_2\text{O}$	+0.17
$\text{Fe}^{3+} + 3 \text{e}^- \rightarrow \text{Fe}$	+0.77	$\text{S}_2\text{O}_8^{2-} + 2 \text{e}^- \rightarrow 2 \text{SO}_4^{2-}$	+2.05
$\text{Fe}^{2+} + \text{e}^- \rightarrow \text{Fe}^{2+}$	-0.53	$\text{Se} + 2 \text{e}^- \rightarrow \text{Se}^{2-}$	-0.67
$\text{Ga}^+ + \text{e}^- \rightarrow \text{Ga}$	0, by definition	$\text{Sn}^{2+} + 2 \text{e}^- \rightarrow \text{Sn}$	-0.14
$2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{H}_2$	+1.60	$\text{Sn}^{4+} + 2 \text{e}^- \rightarrow \text{Sn}^{2+}$	+0.15
$2 \text{HBrO} + 2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{Br}_2 + 2 \text{H}_2\text{O}$	+1.63	$\text{Sr}^{2+} + 2 \text{e}^- \rightarrow \text{Sr}$	-2.89
$2 \text{HClO} + 2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{Cl}_2 + 2 \text{H}_2\text{O}$	-0.83	$\text{Te} + 2 \text{e}^- \rightarrow \text{Te}^{2-}$	-0.84
$2 \text{H}_2\text{O} + 2 \text{e}^- \rightarrow \text{H}_2 + 2 \text{OH}^-$	+1.78	$\text{Ti}^{2+} + 2 \text{e}^- \rightarrow \text{Ti}$	-1.63
$\text{H}_2\text{O}_2 + 2 \text{H}^+ + 2 \text{e}^- \rightarrow 2 \text{H}_2\text{O}$	+3.0	$\text{Ti}^{3+} + \text{e}^- \rightarrow \text{Ti}^{2+}$	-0.37
$\text{H}_4\text{XeO}_6 + 2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{XeO}_3 + 3 \text{H}_2\text{O}$	+0.79	$\text{Ti}^{4+} + \text{e}^- \rightarrow \text{Ti}^{3+}$	0.00
$\text{Hg}_2^{2+} + 2 \text{e}^- \rightarrow 2 \text{Hg}$	+0.85	$\text{Ti}^{4+} + \text{e}^- \rightarrow \text{Ti}^+$	-0.34
$\text{Hg}^{2+} + 2 \text{e}^- \rightarrow \text{Hg}$	+0.92	$\text{U}^{3+} + 3 \text{e}^- \rightarrow \text{U}$	-1.79
$2 \text{Hg}^{2+} + 2 \text{e}^- \rightarrow \text{Hg}_2^{2+}$	+0.27	$\text{U}^{4+} + \text{e}^- \rightarrow \text{U}^{3+}$	-0.61
$\text{Hg}_2\text{Cl}_2 + 2 \text{e}^- \rightarrow 2 \text{Hg} + 2 \text{Cl}^-$	+0.54	$\text{V}^{2+} + 2 \text{e}^- \rightarrow \text{V}$	-1.19
$\text{I}_2 + 2 \text{e}^- \rightarrow 2 \text{I}^-$	+0.53	$\text{V}^{3+} + \text{e}^- \rightarrow \text{V}^{2+}$	-0.26
$\text{I}_3^- + 2 \text{e}^- \rightarrow 3 \text{I}^-$	-0.14	$\text{Zn}^{2+} + 2 \text{e}^- \rightarrow \text{Zn}$	-0.76
$\text{In}^+ + \text{e}^- \rightarrow \text{In}$			

min

Internal Assessment: F.M.:15

Time: 1 hr

Subject Code: HU 100

Q.1 Multiple Choice Questions: (Group A)

$5 \times 1 = 5$

- a. Jargon
 - 1. Technical Words, 2. Vocabulary, 3. Corporate Term, 4. Metaphor
- b. Classroom Communication is
 - 1. Mass Communication, 2. Meta Communication, 3. Group Communication
- c. Semantics is the study of
 - 1. Words, 2. Sentence Structure, 3. Meaning, 4. Pitch
- d. Billboard/ Hoarding is an example of
 - 1. Image, 2. Audio Communication, 3. Visual Communication, 4. Audio-Visual Communication
- e. Group Discussion is an example of
 - 1. Upward Communication, 2. Lateral Communication, 3. Diagonal Communication

(Group B)

Q.2. What are the differences between Oral and Written Communication? (5)

Q.3. "Communication is Situation-Bound", Discuss. (5)

or

Q.4. "Communication is the nervous-system of any organization". Discuss. (5)

End Semester Examination April 2013

Course Name: Elements of Electronics and Communication Engg.

Course Code: EC 100

Year: I

Date: 02-05-2013

Time: 09.30- 12.30

Duration: 3 Hrs

Max. Marks: 100

Instructions: Answer all questions.

Answer in single word (2 mark each)

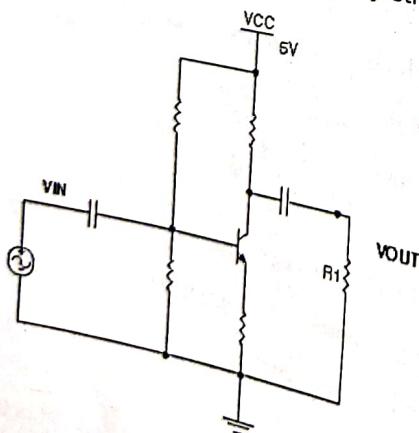
- 1: What is the rms value of a load current in case of,a half wave rectifier..?
- 2: The peak inverse voltage of aFWR with centre tap transformer is _____ .
- 3: The knee voltage of a Germanium diode is _____ volts
- 4: Forward voltage across a conducting silicon diode is _____ volts.
- 5: Irms for half wave rectifier is_____.
- 6: when a transistor is used in digital circuit, it works in the _____ regions.
- 7: The phase difference between input and output of an emitter follower is _____
- 8: Which configuration is used for impedance matching..?
- 9: What is the voltage gain of an emitter follower..?
- 10: Zener diode can be used for rectification. Ind out whether this statement is true or false..?
- 11: Three different Q-points are shown on a load line. The upper is shown for _____ current gain.

- 12: The current ratio I_C/I_E , usually less than one. Is called _____
- 13: With the positive probe on an NPN base, the ohmmeter reading with other terminals should be _____.
- 14: A decrease in the base current of a CE amplifier causes the voltage measured between the emitter and collector to decrease. True or false...?
- 15: The coupling capacitors in RC coupled amplifier affect the gain in -----frequency.
- 16: how is the dc current through each diode in bridge rectifier related to the load current..?
- 17: In a transistor $I_C=9mA$ $I_E=10mA$, what is the value of I_B ..?
- 18: What is the function of coupling capacitor...?
- 19: Which configuration is used to get highest power gain...?
- 20: List four advantages of voltage divider biasing.

- 23: a) Determine beta=8
a circuit
b) Why your method
- 24: Draw and explain current if $V_{CC}=$
- 25: Construct the re
- 26: What will happen
Sketch the effect

Answer in detail(10 marks each)

- 21: Design the following circuit and find out the values of components.
 $V_{CC}=8V$, $\beta=100$, $I_C \text{ max}=2mA$. Justify each point of your design.



- 22: a) Why emitter resistor is used in a voltage divider bias.
 b) What is the function of bypass capacitor.

- 23: a) Determine the R_c and R_b for a fixed bias configuration, if $V_{cc}=12\text{ V}$, $\beta=80$, and $I_{cQ}=3\text{mA}$, $V_{ceQ}=6\text{V}$. Use standard values and mark it on a circuit diagram.
b) Why you are not suggesting fixed bias circuit as a good biasing method..?
- 24: Draw and explain a current mirror circuit, and find out the mirrored current if $V_{cc}=18\text{V}$, $R_{c1}=2\text{Kohm}$, $\beta=200$
- 25: Construct the r_e model of a voltage divider biasing circuit and explain.
- 26: What will happen to the output ac signal if the dc level is insufficient..?
Sketch the effect on the waveform and explain.

Roll no _____

NATIONAL INSTITUTE OF TECHNOLOGY GOA

[Farmagudi, Ponda, Goa - 403 401.]

End Semester Examination Course Name: Engineering Mathematics Date: 03.05.13 Time: 09.30 A.M-12.30 A.M	Apr-May 2013 Course Code: MA101 Duration: 03 Hrs Max. Marks: 100
---	---

Instructions: Answer all questions:

- Assume suitable data wherever necessary.
- Give precise answer for all the questions.
- State the relevant formulae used in each question before answering.
- Draw relevant diagrams in each question.

1. Verify Stoke's theorem for $\vec{F} = (x^2 - y^2)\hat{i} + 2xy\hat{j}$ in the rectangular region in xy plane bounded by the lines $x=0$, $x=a$, $y=0$ and $y=b$.

8 Marks

2. Using Gauss divergence theorem, find $\iint_S \vec{F} \cdot \hat{n} dS$, where $\vec{F} = (2x + 3z)\hat{i} - (xz + y)\hat{j} + (y^2 + 2z)\hat{k}$ and S is the surface of the sphere having centre at $(3, -1, 2)$ and radius 3.

5 Marks

3. Evaluate by Green's theorem $\int_C e^{-x} (\sin y dx + \cos y dy)$ where C is the rectangle with vertices $(0, 0)$, $(\pi, 0)$, $(\pi, \pi/2)$, $(0, \pi/2)$.

5 Marks

4. Derive relation between Beta and Gamma function.

7 Marks

5. Solve $(D^2 - 4D + 3)y = \sin 3x \cos 2x$

8 Marks

6. Solve $x \frac{dy}{dx} + \frac{y^2}{x} = y$

6 Marks

7. Solve $(1 + y^2)dx = (\tan^{-1}y - x)dy$

6 Marks

8. Solve $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} - 3y = x^2 \log x$

10 Marks

9. Solve $(2x + 3)^2 \frac{d^2y}{dx^2} - 2(2x + 3) \frac{dy}{dx} - 12y = 6x$

10 Marks

10. Solve $\frac{d^2y}{dx^2} + y = \operatorname{cosec} x$ by using method of variation of parameters.

10 Marks

11. Solve the simultaneous equations $\frac{dx}{dt} + 2x - 3y = 5t$; $\frac{dy}{dt} - 3x + 2y = 0$
given that $x(0)=0$ and $y(0)=-1$ **13 Marks**

12. Solve $\frac{dx}{xy} = \frac{dy}{y^2} = \frac{dz}{xyz-2x^2}$ **6 Marks**

13. Solve the partial differential equation $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$. **6 Marks**

**** ALL THE BEST ***

$\text{I}^{\text{st}} \text{ year}$	Roll No						
-------------------------------------	---------	--	--	--	--	--	--



National Institute of Technology Goa

Programme Name: B.Tech.

End Semester Examinations, November 2015

Course Code: MA 100

Date: 20/11/2015

Duration: 3 Hours

Course Name: Mathematics-I

Time: 2.00 to 5.00 PM

Max. Marks: 100

ANSWER ALL QUESTIONS

PART - A

1. Evaluate:

$$\int_0^\infty \int_0^\infty \frac{1}{(1+x^2+y^2)^2} dx dy$$

[4]

2. Find the distance between the planes $x + 2y + 6z = 1$ and $x + 2y + 6z = 10$. Justify your answer. [4]

3. Prove that the harmonic series $\sum_{n=1}^{\infty} \frac{1}{n} = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots$ is divergent. [4]

4. Identify the conic section $x^2 - 3xy + y^2 = 5$ by rotating the coordinate axes to find a new equation for the conic section that has no cross product term. [4]

5. Using the series representation for $\sin 3x$, find the values of r and s in the following equation:

$$\lim_{x \rightarrow 0} \left(\frac{\sin 3x}{x^3} + \frac{r}{x^2} + s \right) = 0$$

[4]

PART - B

1. (a) Find the height and radius of the largest right circular cylinder that can be put in a given sphere of radius $\sqrt{3}$. [5]
 (b) Let $f(x) = 3x - x^3$. Show that the equation $f(x) = -4$ has a solution in the interval $[2, 3]$ and use Newton's method to find it. [5]

[P.T.O.]

solves the initial value problem

$$y = x^2 + \int_1^x \frac{1}{t} dt$$

$$\frac{d^2y}{dx^2} = 2 - \frac{1}{x^2}; y'(1) = 3, y(1) = 1.$$

- (b) Find the total area of the region between the two curves $y = \sin x$ and the $y = \cos x$ for $0 \leq x \leq 3\pi/2$.

[5+5]

3. State and prove Cauchy's Mean Value Theorem.

[10]

4. (a) Find the Fourier series associated with the given function. Sketch the function.

[5]

$$f(x) = \begin{cases} 1 & \text{if } 0 \leq x \leq \pi \\ -1 & \text{if } \pi < x \leq 2\pi \end{cases}$$

- (b) Check for the convergence of $\sum_{n=0}^{\infty} e^{-n^2}$. [5]

5. Find the maximum value $w = xyz$ of on the line of intersection of the two plane $x + y + z = 40$ and $x + y - z = 0$.

Also, give a geometric argument to support your claim that you have found a maximum, and not a minimum, value of w . [5+5]

6. Use Taylor's formula to find a quadratic approximation of $f(x, y) = e^x \sin(y)$ at the origin.

[10]

Estimate the error in the approximation if $|x| \leq 0.1$ and $|y| \leq 0.1$.

7. (a) Evaluate:

$$\int_{-1}^1 \int_{-\sqrt{1-y^2}}^0 \left[\frac{4\sqrt{x^2+y^2}}{1+x^2+y^2} \right] dx dy$$

- (b) If the "population density" of a certain bacterium on the xy -plane is represented by,

$$f(x, y) = \frac{10,000e^x}{1+|x|/2}$$

where x and y are measured in centimeters, find the total population of bacteria within the rectangle $-5 \leq x \leq 5$ and $-2 \leq y \leq 0$. [5+5]

8. (a) Find the volume and also the moment of inertia about z -axis of the ice cream cone D cut from the solid sphere $\rho \leq 2$ by the surface $\phi = \pi/3$. [5]

- (b) Evaluate the

$$\int_0^3 \int_0^4 \int_{x=y/2}^{x=(y/2)+1} \left(\frac{2x-y}{2} + \frac{z}{3} \right) dx dy dz$$

by applying the transformation $u = \frac{2x-y}{2}$, $v = y/2$, $w = z/3$ and integrating over an appropriate region in uvw -space. [5]

2. (a) Show that

solves the initial value problem

$$y = x^2 + \int_1^x \frac{1}{t} dt$$

$$\frac{d^2y}{dx^2} = 2 - \frac{1}{x^2}; y'(1) = 3, y(1) = 1.$$

(b) Find the total area of the region between the two curves $y = \sin x$ and the $y = \cos x$ for $0 \leq x \leq 3\pi/2$.

[5+5]

3. State and prove Cauchy's Mean Value Theorem.

[10]

4. (a) Find the Fourier series associated with the given function. Sketch the function.

[5]

$$f(x) = \begin{cases} 1 & \text{if } 0 \leq x \leq \pi \\ -1 & \text{if } \pi < x \leq 2\pi \end{cases}$$

(b) Check for the convergence of $\sum_{n=0}^{\infty} e^{-n^2}$.

[5]

5. Find the maximum value $w = xyz$ of on the line of intersection of the two plane $x + y + z = 40$ and $x + y - z = 0$.

Also, give a geometric argument to support your claim that you have found a maximum, and not a minimum, value of w .

[5+5]

6. Use Taylor's formula to find a quadratic approximation of $f(x, y) = e^x \sin(y)$ at the origin.

Estimate the error in the approximation if $|x| \leq 0.1$ and $|y| \leq 0.1$.

[10]

7. (a) Evaluate:

$$\int_{-1}^1 \int_{-\sqrt{1-y^2}}^0 \left[\frac{4\sqrt{x^2+y^2}}{1+x^2+y^2} \right] dx dy$$

(b) If the "population density" of a certain bacterium on the xy -plane is represented by,

$$f(x, y) = \frac{10,000e^x}{1+|x|/2}$$

where x and y are measured in centimeters, find the total population of bacteria within the rectangle $-5 \leq x \leq 5$ and $-2 \leq y \leq 0$.

[5+5]

8. (a) Find the volume and also the moment of inertia about z -axis of the ice cream cone D cut from

the solid sphere $\rho \leq 2$ by the surface $\phi = \pi/3$.

[5]

(b) Evaluate the

$$\int_0^3 \int_0^4 \int_{x=y/2}^{x=(y/2)+1} \left(\frac{2x-y}{2} + \frac{z}{3} \right) dx dy dz$$

by applying the transformation $u = \frac{2x-y}{2}$, $v = y/2$, $w = z/3$ and integrating over an appropriate region in uvw -space.

[5]



18th Jan
Roll no _____

National Institute of Technology Goa

End Semester Examinations November 2015
Programme Name: B.Tech.

SET 4

Course Name: ENGINEERING DRAWING
Date: 21 Nov 2015
Duration: 3 Hours

Course Code: ME 101
Time: 2 pm – 5 pm
Max. Marks: 100

ANSWER ALL QUESTIONS

Please Read the following Instructions before solving:

All dimensions are in mm
Use first angle projection method
Use aligned dimensioning system
Retain Construction lines
Line work and neatness carries weightage

1. A line PQ, 60 mm long has one of its ends in HP and 30 mm in front of VP. If the line is inclined at 30° to HP and 45° to VP, draw its projections and find its traces. (14 marks)
2. A rectangular pentagonal lamina of 30 mm sides touches VP with one of its sides. Draw its projections when the surface is inclined at 45° to VP and the side which touches VP makes 30° to HP. (18 marks)
3. A pentagonal pyramid of edge of base 30 mm and length of axis 70 mm is resting on a corner of the base on the HP. The triangular face opposite of the corner on the HP is inclined to the HP at 50° . Draw its projections. (18marks)
4. A cylinder with a 60 mm diameter and a 100 mm height stands on its base on the HP. it is cut by section plane (AIP) inclined at 60° to the HP and intersecting an extreme generator at a point 36 mm from the base. Draw sectional front view and top view. (18 marks)
5. Draw front, top and side view of the objects shown in figure (a) with dimensions. (20 marks)
6. Draw the isometric view of the block whose orthographic views are shown in figure (b). (12 marks)

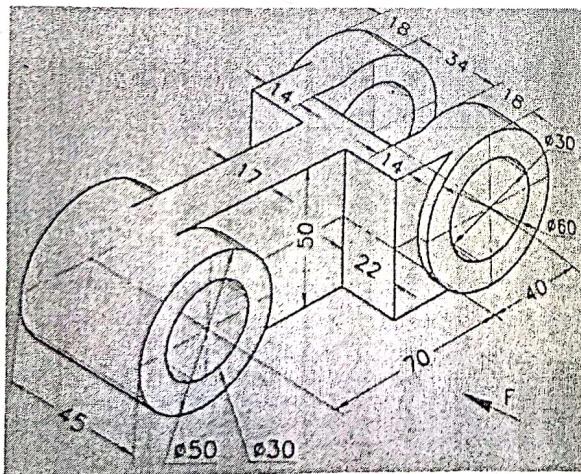


Figure (a)

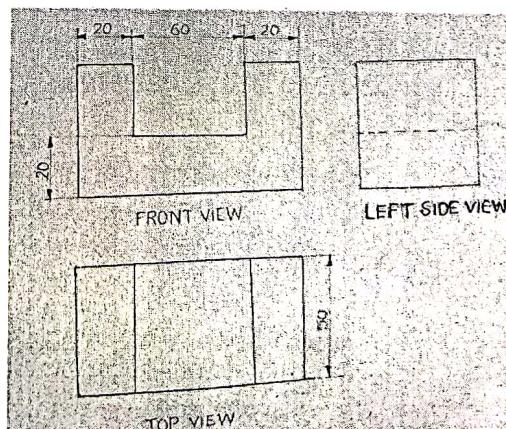


Figure (b)



Roll no _____

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa 403 401

Programme Name: B.Tech/M.Tech/Ph.D
End- Semester Examination April, 2015

Course Name: Review of Literature/Linguistics

Course Code: HU 702

Date: 30/04/2015

Time: 9:30a.m. -12:30 p.m.

Max. Marks: 100

Instructions:

- Don't break the sequence, while answering the questions
- Answer all the Questions

1. Define Cultural Studies. When did it emerge as a separate discipline of study? What do you understand by popular culture? (8+4+8=20)
2. How does Ruskin Bond portray the subalterns in his short stories? Critically evaluate it with reference to two of his short stories? (20)
3. What is New Historicism? "Texts are necessary to understand the social context, even though we must be alert to the fact that we only have access to the past through these biased texts". Discuss this statement with reference to Tagore's *The Home and the World*. (20)
4. Define "Gynocriticism" and "*Écriture Feminine*"? (10+10=20)
(5 x 4 =20)
5. Write short notes on
 - Dialogue
 - Heteroglossia
 - Chronotope
 - Carnival



End Semester Examinations November 2015
Programme Name: B.Tech.

SET 3

Course Name: ENGINEERING DRAWING
Date: 21 Nov 2015
Duration: 3 Hours

Course Code: ME 101
Time: 2 pm – 5 pm
Max. Marks: 100

ANSWER ALL QUESTIONS

Please Read the following Instructions before solving:

All dimensions are in mm
Use first angle projection method
Use aligned dimensioning system
Retain Construction lines
Line work and neatness carries weightage

1. The end A of a line AB of length 80 mm is in the HP and 20 mm in front of VP. If the line is inclined 45° to HP and 30° to VP, draw its projections and measures their inclinations with the XY line and find its traces. (14 marks)
2. A pentagonal plate of negligible thickness and having edge length 30 mm is resting on one of its sides on VP. The plate is inclined 40° to VP and the resting side makes an inclination of 50° to HP. Draw projection of the plate (18 marks)
3. A pentagonal pyramid of edge of base 30 mm and length of axis 65 mm is resting on a corner of the base on the HP. The triangular face opposite of the corner on the HP is inclined to the HP at 45° .Draw its projections. (18 marks)
4. A cone of 50 mm base diameter and height 60 mm is resting on its base on HP. It is cut by a section plane inclined 45° to HP and passes through the extreme left point of base. Draw the sectional view. (18 marks)
5. Draw front, top and side view of the objects shown in figure (a) with dimensions. (20 marks)
6. Draw the isometric view of the block whose orthographic views are shown in figure (b). (12 marks)

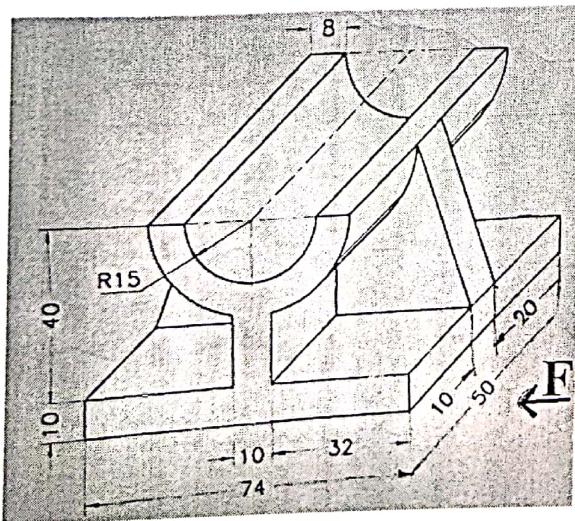


Figure (a)

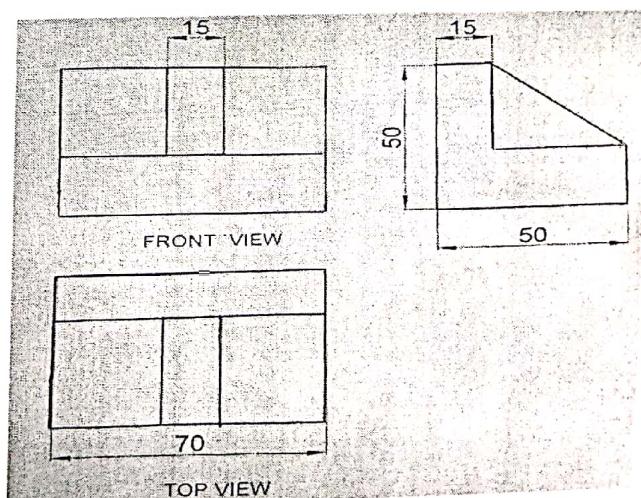


Figure (b)

ANSWER ALL QUESTIONS

Please Read the following Instructions before solving:

Dimensions are in mm

First angle projection method

Aligned dimensioning system

Construction lines

Work and neatness carries weightage

A line AB, 90 mm long, is inclined at 30° to the HP. Its end A is 12 mm above the HP and 20 mm in front of the VP. Its front view measures 65 mm. Draw the top view of AB and measure its length and also determine its inclinations with the VP and find its traces. (14 marks)

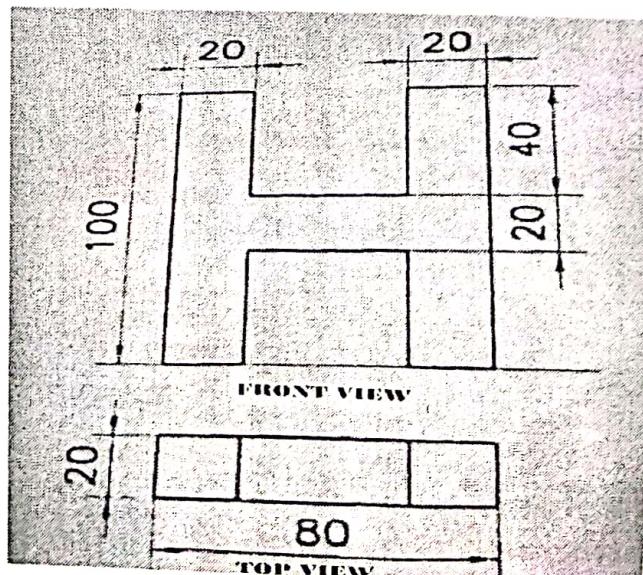
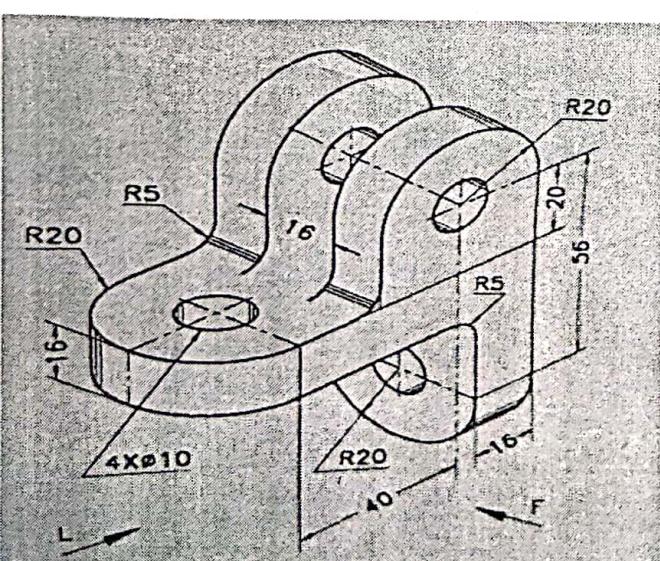
A rectangular plate of negligible thickness having 75 mm length and 50 mm width resting on one of its smaller side on HP. The surface makes an inclination of 30° to HP and the smaller side makes an inclination of 60° to VP. Draw projections of the plate. (18 marks)

A cylinder having diameter 50 mm and height 100 mm is resting on its circumferential point of base with axis parallel to VP. Draw projections of solid if the axis makes angle 45° to the ground. (18 marks)

A cylinder resting on HP on its base is cut by section plane inclined at 40° to HP. Draw the projections of the sectioned cylinder if the cutting plane passes through a point on the axis which is at a height of 90 mm, from the base; take the cylinder diameter as 75 mm and height as 105 mm. (18 marks)

Draw front, top and side view of the objects shown in figure (a) with dimensions (20 marks)

Draw the isometric view of the block whose orthographic views are shown in figure (b). (12marks)





157
Roll no _____

National Institute of Technology Goa

End Semester Examinations November 2015

Programme Name: B.Tech.

SET 2

Course Name: ENGINEERING DRAWING

Date: 21 Nov 2015

Duration: 3 Hours

Course Code: ME 101

Time: 11 am – 2 pm

Max. Marks: 100

ANSWER ALL QUESTIONS

Please Read the following Instructions before solving:

All dimensions are in mm

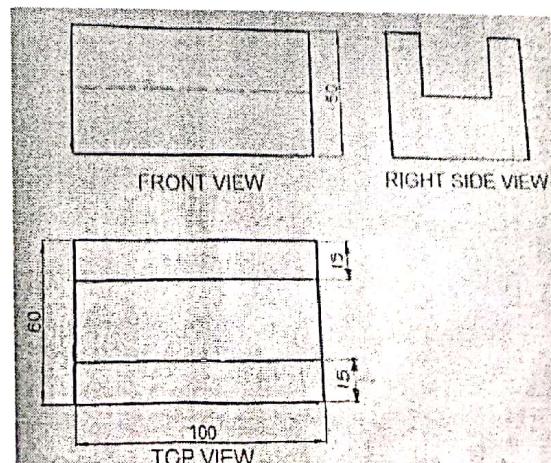
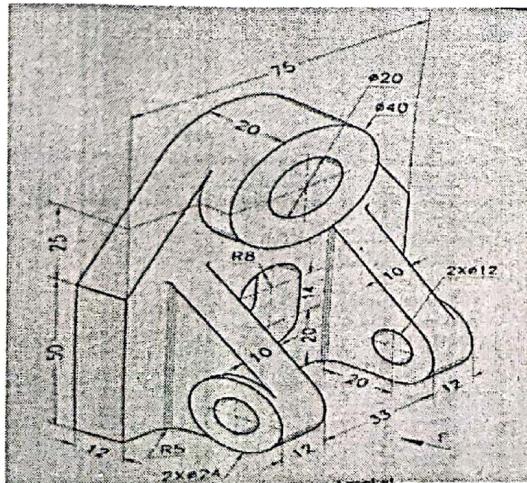
Use first angle projection method

Use aligned dimensioning system

Retain Construction lines

Line work and neatness carries weightage

1. The top view of 75 mm long line AB, measures 65 mm while the length of its front view is 50 mm. It's one end A is in the HP and 12 mm in front of the VP. Draw the projections of AB and determine its inclinations with the HP and VP, find its traces. (14 marks)
2. A rectangular plate of negligible thickness having 75 mm length and 50 mm width resting on one of its smaller side on HP. The surface makes an inclination of 30° to HP and the smaller side makes an inclination of 60° to VP. Draw projections of the plate. (18 marks)
3. A cylinder having diameter 60 mm and height 100 mm is resting on its curved surface on the ground in such a way that its base makes an angle of 50° to VP and the axis parallel to the ground. Draw projections of solid. (18 marks)
4. A pentagonal pyramid side of base 30 mm and axis 90 mm long is resting on its base with one of its base edge parallel, nearer and 15 mm away from VP. It is cut by a plane passing through the Centre of the axis and one corner of the base which is on the extreme right. The cutting plane is perpendicular to the VP. Draw sectional front view and top view. (18marks)
5. Draw front, top and side view of the objects shown in figure (a) with dimensions. (20 marks)
6. Draw the isometric view of the block whose orthographic views are shown in figure (b). (12 marks)





Roll No									
---------	--	--	--	--	--	--	--	--	--

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

Programme Name: B.Tech.
Mid Semester Examinations, February-2017

Course Name: Professional Communication-II

Course code: HU 501

Duration: 1 hour 30 Minutes

Date: 20/02/2017

Time: 4:00 p.m. - 5:30 p.m.

Max. Marks: 50

ANSWER ALL QUESTIONS

Instructions:

- Don't break the sequence of the Questions
- Do not write answer of the same question in parts at different places

1. What are the 7Cs of 21st century skills? Which of them are the key skills? Why? [3.5M+3M+4]
2. Write an essay on Are we becoming technological zombies? [8M]
3. What are the five worst body gestures that could sink your chances in a job interview? [2.5M]
4. How does body language help you to communicate? [3M]
5. Prepare an advertisement content of the given situational image : [4M]



6. Match the words of Column A with Column B [5M]

A

- a. To go astray
- b. To carve out
- c. To put out
- d. Strait
- e. Faux pas
- f. To blow hot and cold

B

- 1. To extinguish
- 2. Wavering between two moods
- 3. Blunder
- 4. Initiator
- 5. To speak unfair
- 6. Finding the exact reason

- g. Trailblazer
 - h. To hit below the belt
 - i. To hit the nail on the head
 - j. To put out
- 7. Wander off the right path
 - 8. Channel
 - 9. Extinguish
 - 10. Creation

7. Read the case, analyze and offer solution to McSherry.

[7M]

Prosys Business Solutions is a small Scottish based business software company founded in 1988 by McSherry an IT salesman. The business grew to 22 employees by 2001. Along with most of their immediate competitors in the IT sector, Prosys was badly hit by the September 11th incident and by the general downturn in business post this event. McSherry had to take action to cut back the business in order to survive.

The case study tells the story of the development of the business and the actions taken by McSherry. Moving on from this situation, the company now has three main elements of business; as a business software developer, a reseller of other business software, and as a service call centre for business clients with IT problems. Now in 2003, McSherry and his colleagues have to decide carefully which parts of the business should receive the investment needed to keep the business profitable. This decision needs to be taken in the context of a very uncertain business climate post terror attack.

8. Compose a short story based on the given clue:
Your story should have a title

[8M+2M]

Rajiv picked up a wrong trolley bag from the conveyor belt...

Roll No _____



National Institute of Technology Goa

End Semester Examination, May-2015

Department of Humanities and Sciences

Course Name: MATHEMATICS-II

Date: May 1, 2015

Duration: 3Hours.

Course Code: MA 150

Time: 9:30 AM

Max. Marks: 100

ANSWER ALL QUESTIONS

PART - A

($10 \times 2 = 20$)

1. Prove or disprove: If $S = \{v_1, v_2, v_3, v_4, v_5, v_6\}$ is linearly dependent set of vectors in R^5 then each vector of S must be a linear combination of the remaining vectors of S .
2. Let A be an $n \times n$ matrix such that the system of equations $AX = 0$ has a non-trivial solution. Is it possible that the system of equation $A^t X = b$ has a unique solution for some $b \in R^n$? Justify.
3. Find a 2×2 matrix A that has $u = [2, 2]^t$ and $v = [4, 5]^t$ as eigenvectors with associated eigenvalues 3 and 1 respectively.
4. Prove or disprove: There exist 2×2 matrices A and B such that $AB - BA = I_2$.
5. Consider the square matrix $A = \begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$
 - (a) If 3 is an eigenvalue of A then find the eigenvalue of $\text{adj}(A)$
 - (b) Find the nature of eigen vectors.
6. Prove that the eigen values of a skew-Hermitian matrix are purely imaginary.
7. Find the Laplace transform of the following functions
 - (a) e^{t^2}
 - (b) $(t^2 - 1)H(t - 1)$
8. Find the relation between $H(t - a)$ and $\delta(t - a)$
9. If $\int_1^5 t^n \delta(t - 2) dt = 8$, what is the exponent n ?
10. Compute $t * t * t$

(8 × 10 = 80)

PART - B

[5M]

11. (a) Solve: $y' = e^{x-y} (e^x - e^y)$
(b) Find the orthogonal trajectories of the family of curve $x^2 - y^2 = c$ and also sketch the relevant graphs [5M] [10M]

12. Apply the variation of parameters method to solve the differential equation:

$$x^3 y''' - 3x^2 y'' + 6xy' - 6y = x^4 \ln x.$$

13. (a) Let λ_1 and λ_2 be two distinct eigenvalues of a matrix A and let u_1 and u_2 be eigenvectors of A corresponding to λ_1 and λ_2 , respectively. Show that $u_1 + u_2$ is not an eigenvector of A . [5M]
(b) Determine the eigenvalues and eigenvectors of $B = 2A^2 - (A/2) + 3I$ where $A = \begin{pmatrix} 8 & -4 \\ 2 & 2 \end{pmatrix}$ [5M]

14. Reduce the following quadratic form to standard form by making an approximate change of variables, $X = QY$ where Q is an orthogonal matrix

$$6x^2 + 3y^2 + 3z^2 - 2yz + 4zx - 4xy$$

15. (a) Find the Laplace inverse transform of

[5M]

$$\ln \left[1 + \frac{\omega^2}{s^2} \right]$$

- (b) Using the Laplace transform, solve the integral equation

[5M]

$$y(t) = 1 - \sinh t + \int_0^t (1 + \tau) y(t - \tau) d\tau$$

16. (a) Let S be the subspace of \mathbb{R}^5 spanned by $\langle 1, 1, -1, 0, 0 \rangle$, $\langle 0, 2, 1, 0, 0 \rangle$ and $\langle 0, 1, -2, 0, 0 \rangle$. Find the vector in S closest to $\langle 3, 0, 0, 1, 4 \rangle$.
(b) Determine whether the following points are collinear: $\langle -1, 1, 6 \rangle$, $\langle 2, 0, 1 \rangle$ and $\langle 3, 0, 0 \rangle$. If not, determine the equation for the plane containing these points. [5M]

17. (a) Solve the following the linear system of equation:

[5M]

$$\begin{cases} 7x_1 - 3x_2 + 4x_3 = -7 \\ 2x_1 + x_2 - x_3 + 4x_4 = 6 \\ x_2 - 3x_4 = -5 \end{cases}$$

- (b) Find the least square line for the data points given below:
 $[1, 3.8]$, $[3, 11.7]$, $[5, 20.6]$, $[7, 26.5]$, and $[9, 35.2]$.

18. Consider the differential equation $y''' - 2y'' - y' + 2y = 0$. Convert given differential equal to three first order differential equations and solve them by matrix method. [5M]

[5M]

* * * ALL THE BEST * *

[10M]

1st yr1st yr

Roll no							
---------	--	--	--	--	--	--	--



National Institute of Technology Goa

End Semester Examinations November 2015

Programme Name: B.Tech.

Course Name: ENGINEERING MECHANICS

Date: 19 Nov 2015

Duration: 3 Hours

Course Code: ME 100

Time: 2 pm - 5pm

Max. Marks: 100

ANSWER ALL QUESTIONS

1. Three ropes are attached to the post at A as shown in Figure (1). The forces in the ropes are $F_1 = 260\text{lb}$, $F_2 = 75\text{lb}$, and $F_3 = 60\text{lb}$. Determine the magnitude of the resultant force R that is equivalent to the three forces (6Marks)

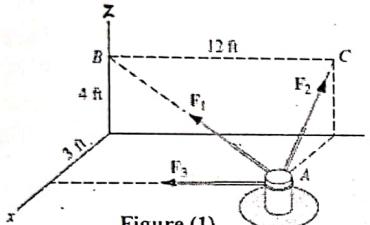


Figure (1)

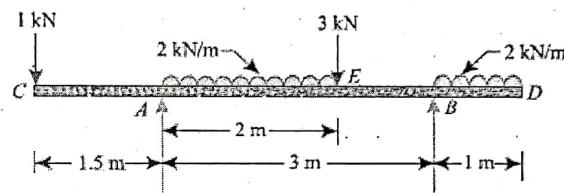


Figure (2)

2. A beam AB of span 3m, overhanging on both sides is loaded as shown in Figure (2). Determine the reactions at the supports A and B. (8Marks)

3. Two blocks A and B, connected by a horizontal rod and frictionless hinges are supported on two rough planes as shown in Figure (3). The coefficients of friction are 0.3 between block A and the horizontal surface, and 0.4 between block B and the inclined surface. If the block B weighs 100 N, what is the smallest weight of block A, that will hold the system in equilibrium? (7Marks)

4. The structure shown in Figure (4) is loaded by the 240-lb.in. counter-clockwise couple applied to member AB. Neglecting the weights of the members, determine all forces acting on member BCD. (10Marks)

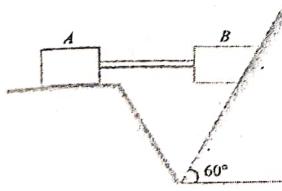


Figure (3)

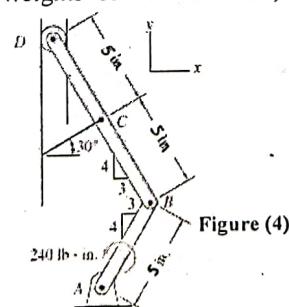


Figure (4)

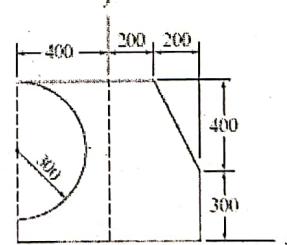


Figure (5)

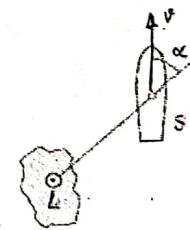


Figure (6)

5. Determine the location of the centroid of the shaded area shown in Figure (5) using the method of composite areas. All dimensions are in mm (9Marks)

6. A ship S moves as shown in Figure 6 with a velocity of constant magnitude v , where the angle α between the velocity vector v and the connecting line to the lighthouse L remains constant. What is the magnitude of the acceleration and what is the trajectory of the ship? (10Marks)

7. A particle starts from rest at $x = -2\text{m}$ and moves along the x -axis with the velocity history shown in figure (7). Plot the corresponding acceleration and the displacement histories for the 2 seconds. Find the time t when the particle crosses the origin. (8Marks)

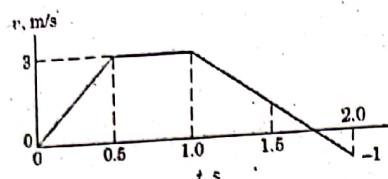


Figure (7)

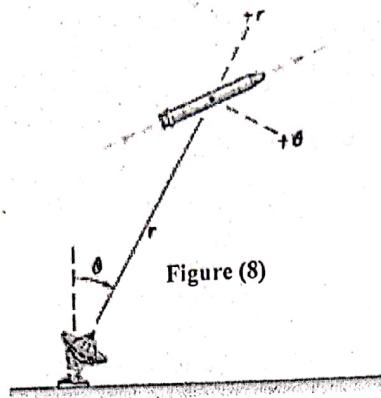


Figure (8)

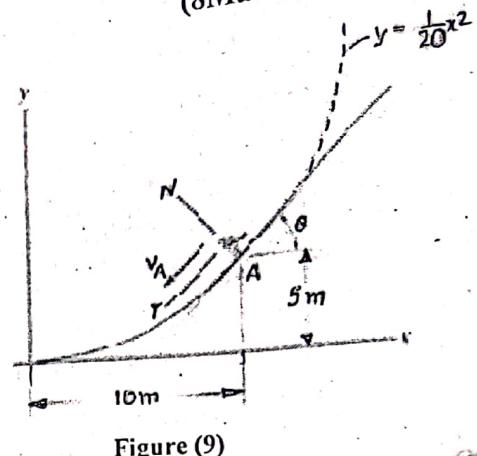


Figure (9)

8. A tracking radar lies in the vertical plane of the path of a rocket which is coasting in unpowered flight above the atmosphere as shown in figure (8). For the instant when $\theta = 30^\circ$, the tracking data give $r = 25(10^4)$ ft, $r = 4000$ ft/sec, and $\dot{\theta} = 0.80\text{deg/sec}$. The acceleration of the rocket is due only to gravitational attraction and for its particular altitude is 31.4 ft/sec^2 vertically down. For these conditions determine the velocity v of the rocket and the values of r and $\dot{\theta}$. (8Marks)

9. When the skier reaches point A along the parabolic path shown in Figure (9), he has a speed of 5 m/s which is increasing at 2 m/s^2 . Determine the direction of his velocity and the direction and magnitude of his acceleration at this instant. Neglect the size of the skier in the calculation. (10Marks)

10. The power winch A hoists the 800-lb log up the 30° incline at a constant speed of 4 ft/sec as shown in figure (10). If the power output of the winch is 6 hp, compute the coefficient of kinetic friction μ_k between the log and the incline. If the power is suddenly increased to 8 hp, what is the corresponding instantaneous acceleration a of the log? (8Marks)

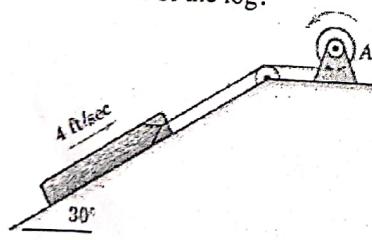


Figure (10)

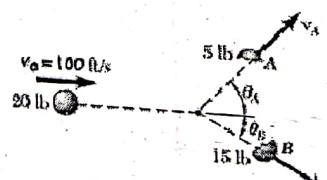


Figure (11)

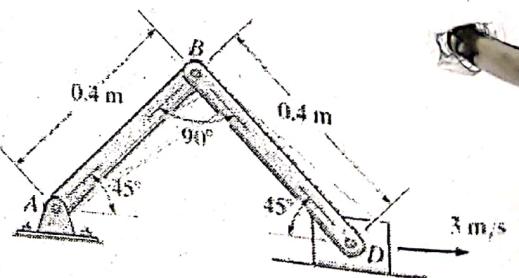


Figure (12)

11. A 20-lb projectile is moving with a velocity of 100 ft/s as shown in figure (11) when it explodes into 5 and 15-lb fragments. Immediately after the explosion, the fragments travel in the directions $\theta_A = 45^\circ$ and $\theta_B = 30^\circ$. Determine the velocity of each fragment.

12. A linkage undergoing motion as shown in figure (12). The velocity of the block, V_D , is 3 m/s. Determine the angular velocities of links BD and AB, at the instant shown. (8Marks)



1st year
Roll no _____

National Institute of Technology Goa

End Semester Examinations November 2015

Programme Name: B.Tech/M.Tech/Ph.D

Course Name: Professional Communication

Course Code: HU 100

Date: 18/11/2015

Duration: 3 Hours

Time: 2p.m.-5p.m.

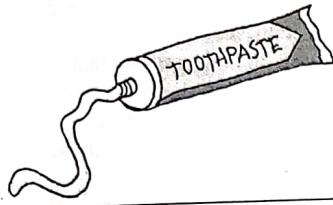
Max. Marks: 100

Instruction:

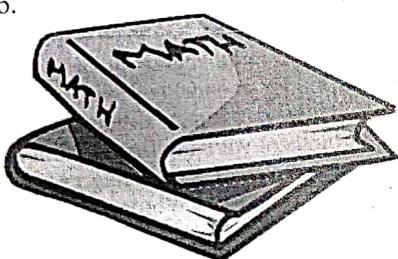
- Answer all the questions
- Don't break the sequence

Q 1. Prepare advertisement of the following items: (5x2=10)

a.



b.



Q 2. Prepare a User Manual of an Air Conditioner. (8)

Q 3. Assume that you are the Manager of Pearl Housing Estate. Write a Report to the MD of your company based on the survey explaining whether it is feasible or not to build Duplex housing complex in Ponda, Goa. Invent the necessary details and aids. (12)

Q 4. The employees of your organization are arriving late every day. As a Chief Engineer of CPWD, Goa, ask for an immediate explanation from the concerned employees. (6)

Q 5. Our non-verbal behaviour is culture specific. Can you substantiate this statement with examples of different Kinesics? (5)

Q. 6. What differences are observed in the body language of different individuals: A is Aggressive, B is Passive. (5)

Q. 7. How does the concept of space play a crucial role in Professional Communication? Give examples to support your argument. (10)

Q. 8. Assume that you are the Product Manager of Essar oil. You had been requested by the Manager of JET Airlines to supply 96,000 gallons of Mineral Oil on credit. Write a letter of refusal to your customer. (Invent necessary details) (8)

Q. 9. Make a Précis of the following content and add a suitable title to it

Many great inventions are initially greeted with ridicule and disbelief. The invention of the airplane was no exception. Although many people who heard about the first powered flight on December 17, 1903 were excited and impressed, others reacted with peals of laughter. The idea of flying an aircraft was repulsive to some people. Such people called Wilbur and Orville Wright, the inventors of the first flying machine, impulsive fools. Negative reactions, however, did not stop the Wrights. Impelled by their desire to succeed, they continued their experiments in aviation. Orville and Wilbur Wright had always had a compelling interest in aeronautics and mechanics. As young boys they earned money by making and selling kites and mechanical toys. Later, they designed a newspaper-folding machine, built a printing press, and operated a bicycle-repair shop. In 1896, when they read about the death of Otto Lilienthal, the brothers' interest in flight grew into a compulsion. Lilienthal, a pioneer in hang-gliding, had controlled his gliders by shifting his body in the desired direction. This idea was repellent to the Wright brothers, however, and they searched for more efficient methods to control the balance of airborne vehicles. In 1900 and 1901, the Wrights tested numerous gliders and developed control techniques. The brothers' inability to obtain enough lift power for the gliders almost led them to abandon their efforts. After further study, the Wright brothers concluded that the published tables of air pressure on curved surfaces must be wrong. They set up a wind tunnel and began a series of experiments with model wings. Because of their efforts, the old tables were repealed in time and replaced by the first reliable figures for air pressure on curved surfaces. This work, in turn, made it possible for the brothers to design a machine that would fly. In 1903 the Wrights built their first airplane, which cost less than \$1,000. They even designed and built their own source of propulsion-a lightweight gasoline engine. When they started the engine on December 17, 1903, the airplane pulsated wildly before taking off. The plane managed to stay aloft for 12 seconds, however, and it flew 120 feet. By 1905, the Wrights had perfected the first airplane that could turn, circle, and remain airborne for half an hour at a time. Others had flown in balloons and hang gliders, but the Wright brothers were the first to build a full-size machine that could fly under its own power. As the contributors of one of the most outstanding engineering achievements in history, the Wright brothers are accurately called the fathers of aviation. (428 Words)

Q. 10. What is "Semantic Gap" in Communication? What are the steps to be taken to reduce it? (8+2=10)

Q. 11. Design a check-list of delivering an effective presentation. (5)

Q. 12. Assume that you are the CEO of Goa Tourism Department. Write a Press Release promoting Goa as a Tourist Destination among the Russian tourists. (8)

Q. 13. Describe the principles of Communication and how they are applicable in a professional set up. (8)



1st year
Roll no _____

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa 403 401

Programme Name: B.Tech

End Semester Examination, November-2015

Course Name: Physics

Course Code: PH100

Date: 16.11.2015

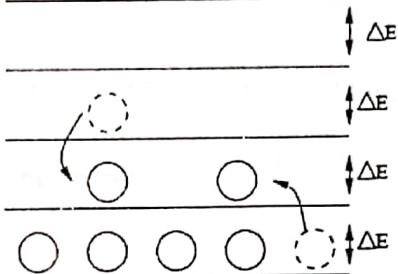
Time: 2.00 PM

Duration: 3 Hours

Max. Marks: 100

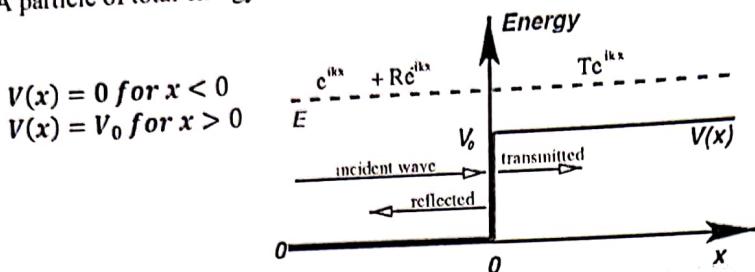
ANSWER ALL QUESTIONS

1. a) Given 5 energy levels, each separated by ΔE . Consider the particles to be weakly interacting, i.e. they exchange energy but do not affect each other's energy levels. Let us look at the first three levels: (i) a particle moves from the 3rd level down to the 2nd level and (ii) a particle moves from 1st level to the 2nd level. In this case, the change in energy is balanced by exchange of particles for the 2 processes. Calculate the macrostate and microstates of this system. (8M)



- b) Write the most probable microstate for Fermi-Dirac statistics and derive the Fermi-Dirac distribution in the form of $f(E)_{BE} = \frac{1}{e^{\alpha + \beta E_i + 1}}$ for a system of indistinguishable Fermions. (8M)
2. a) Cesium has a work function of 1.8 eV. When cesium is illuminated with light of a certain wavelength, the electrons ejected from the surface have kinetic energies ranging from 0 to 2.2 eV. What is the wavelength of the light? (5M)
- b) An X-ray photon of wavelength 10.0 pm is scattered through 110.0° by an electron. What is the kinetic energy of the recoiling electron? (5 M)
- c) Why does a confined particle have quantized energy levels? (3 M)
- d) An electron diffraction experiment is performed using electrons that have been accelerated through a potential difference of 8.0 kV. (a) Find the de Broglie wavelength of the electrons. (b) Find the wavelength and energy of X-ray photons that would give the same diffraction pattern on the same sample. (5M)
- e) A nucleus has a radius of 4 Fermis. Use the uncertainty principle to estimate the kinetic energy for a neutron localized inside the nucleus. (5M)
3. a) Discuss the propagation of light waves through an optical fiber. What are different types of optical fibers? explain. (5M)
- b) A light ray enters from air to a fiber. The refractive index of air is 1. The fiber has refractive index of core equal to 1.5 and that of cladding equal to 1.48. Find: i) Critical angle, ii) Fractional refractive index, iii) Acceptance angle, and iv) numerical aperture. (4M)
- c) Why two level pumping is not suitable for obtaining population inversion in laser system?. With the help of neat energy level diagram, explain the construction and working of He-Ne laser. (5M)

- d) Find the relative populations of the two states in a ruby laser that produces a light beam of wavelength 6943 Å at 300 K and 500 K.
4. a) A particle of total energy E is moving in a one dimensional potential is given by



(8M)

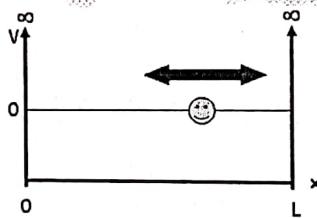
Calculate the reflection coefficient for the case $E > V_0$ and $0 < E < V_0$

- b) At a certain time, the normalized wave function of a particle moving along X-axis has the form given by:

$$\psi(x) = \begin{cases} x + \beta & \text{for } -\beta < x < 0 \\ -x + \beta & \text{for } 0 < x < \beta \end{cases} \text{ and zero elsewhere}$$

Find the value of β and probability that the particle positions between $x = -\frac{\beta}{2}$ and $x = \beta$ (7M)

- c) A particle is confined in an infinite one-dimensional well of length L

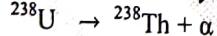


Show that the wave function of the particle is $\psi_n(x) = \sqrt{\frac{2}{L}} \sin\left(\frac{n\pi x}{L}\right)$ and energy of the same particle is

$$E_n = \frac{n^2 h^2}{8mL^2}$$

5. a) Explain nuclear fusion and fission process with examples. (7M)
(5M)

- b) The ^{238}U nuclide can decay by emitting an alpha particle:



The atomic masses of ^{238}U , ^{234}Th and ^4He are 238.0507826 u, 234.0435955 u, and 4.0026032 u respectively. i) Find the disintegration energy ii) Find the kinetic energy of the alpha particle, assuming the parent ^{238}U nucleus was initially rest.

- c) A transition temperature for lead is 7.2 K. However, at 5 K it loses the superconducting property if subjected to magnetic field of $3.3 \times 10^4 \text{ A/m}$. Find the maximum value of H which will allow the metal to retain its superconductivity at 0 K. (5M)

- d) A solar thermal collector having an area of 2 m^2 is used to collect sun's radiation for heating water. i) Name a material that can be used for the making solar collector. Why this material? ii) What should be the colour of the collector surface? why and iii) if the solar radiation falling on the collector is 800 w/m^2 and the efficiency of the system is 40%, how much power it can deliver to water? (4M)

All the best

(6M)

Ist yr

Roll no

National Institute Of Technology Goa

End Semester Examinations November 2015

Programme Name: B.Tech

Course Name: Computer Programming and Problem Solving

Course Code: CS100

Date: 17/11/2015

Time: 2.00pm-5.00pm

Duration: 3 Hours

Max. Marks: 100

ANSWER ALL QUESTIONS

Q1. Roman numerals, the numeric system used in ancient Rome, employ combinations of letters from the Latin alphabet to signify values. In this system, valid digits are:

$$I = 1, V = 5, X = 10, L = 50, C = 100, D = 500, M = 1,000$$

For e.g. the numbers 1 to 10 can be expressed in Roman numerals as follows:

$$I, II, III, IV, V, VI, VII, VIII, IX, X.$$

Write a C program to convert any input decimal number between 1 and 20 to its equivalent Roman representation. [10 marks]

Q2. Write your own atoi() function. The atoi() function takes a string (which represents an integer) as an input argument and returns its value.

The main function looks as follows:

```
int main()
{
    char str[] = "435213";
    int val = atoi(str);
    printf ("%d ", val);
    return 0;
}
```

[8 marks]

Q3. Write a program using loops(for/while/do-while) to print the following sequences:

- a) -10 -20 -30 -40 -50
- b) 1 2 4 7 11 16
- c) 1 2 4 8 16 32

[9 marks]

Q4. Explain the difference between structure, union and bit-fields. [4 marks]

Q5. Explain the C Standard Library functions below and which header files do they belong to?

- a) void *memcpy(void *str1, const void *str2, size_t n)
- b) void *malloc(size_t size)

[4 marks]

Q6. How to dynamically allocate a 2D array in C?

- a) Using a single pointer
- b) Using a pointer to a pointer or Using an array of pointers

[10 marks]

Q7. What does the following function do? Write the iterative version of the program.

```
#include<stdio.h>
#include<stdlib.h>

void f(int n)
{
    if(n<=1){
        printf("%d", n);
    } else {
        f(n/2);
        printf("%d", n%2);
    }
}

int main(int argc, char* argv[])
{
    f(173);
}
```

[10 marks]

Q8. I. Write the complete C program using structures and arrays

- a) Accept information of 82 students in an array of structures with fields: name, roll_no and marks.
- b) Print a report of all roll numbers and the corresponding grade
- c) Print name of the student getting highest marks.

[10 marks]

II. I wish to replace your structure definition with a union. Rewrite your structure definition to make it a union. What would be the consequences of this change to your program in Q8 I.? [5 marks]

Q9. As part of the "Rashtriya Avishkar Abhiyaan" NIT Goa plans to adopt 10 schools in Goa.

The Department of Computer Science and Engineering at NIT Goa proposes to teach C programming to school students under this scheme. We need your assistance to prepare "The C Cheat-Sheet" to be distributed amongst our future programmers.

The cheat-sheet should cover all topics in C that will be needed by any C programmer for reference in his/her programming assignments. For each topic included in your cheat-sheet please accompany it with an example.

[15 marks]

Q10. Write your own implementation of printf() function.

```
int printf(const char *format, ...);
```

Let's restrict your function to print only integers. In all other ways, your printf() function must behave exactly like the one provided by in stdio.h. It should be able to input any number of integers, write them to stdout (standard output) and return the total number of bytes.

Except for the printf() function, you may use any other function from the C Standard Library; make sure to include the header files as needed.

*** Good Luck ***

[15 marks]



Roll no _____

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa 403 401

Programme Name: B.Tech

End Semester Examination, April-2015

Course Name: CHEMISTRY

Date: 30/4/2015

Duration: 3 Hours

Course Code: CY150

Time: 2.00 – 5.00 pm

Max. Marks: 100

1. Answer all the questions
2. Answer for sub questions have to be labeled properly
3. Find reduction potential data as an annexure

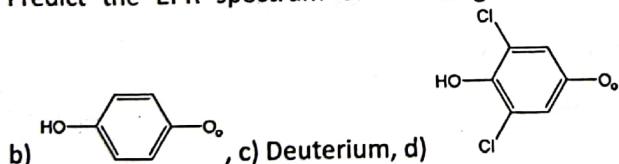
1) A solution containing the complex formed between Bi(III) and thiourea has molar absorptivity of $9.32 \times 10^3 \text{ L mol}^{-1} \text{ cm}^{-1}$ at 470 nm. [4 Marks]

- (a) What is the absorbance of a $3.79 \times 10^{-5} \text{ M}$ solution of the complex at 470 nm in a 1.00 cm cell?
- (b) What is the percent transmittance of the solution described in (a).
- (c) What is the molar concentration of the complex in a solution that has the absorbance described in (a) when measured at 470 nm in a 2.5 cm cell?
- (d) The absorbance of a solution that has half the transmittance of that described in (a).

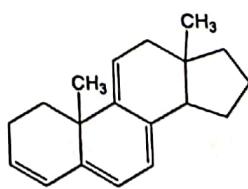
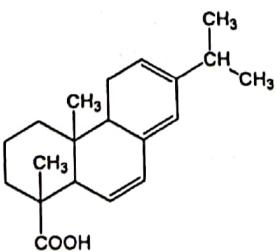
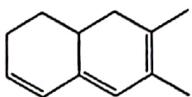
2) How many vibration modes will sulfur dioxide have? Sketch out the possible vibration modes and identify how many IR absorption band would this compound be expected to have. [3 Marks]

3) Calculate the absorption frequency corresponding to the –C-H stretching vibration [3 Marks] treating the group as a simple diatomic C-H molecule with a force constant of $k = 5.0 \times 10^2 \text{ N/m}$.

4) Predict the EPR spectrum of following molecules using energy diagram a) ${}^0\text{CH}_3$, [8 Marks]



5) Predict the λ_{\max} of the following molecules [6 Marks]



Q7. What doe
#include
#include

```
void f(int  
{  
    if(n<=1  
    } else {  
        printf()  
    }  
int main(in  
{  
    f(173);  
}
```

Q8. I. Write the
a) Accept
b) Print a i
c) Print na

II. I wish to r
a union. W

Q9. As part of the
The Departme
to school stude
distributed amo
The cheat-shee
his/her program
with an exempl

10. Write your own

Let's restrict yo
exactly like the
them to stdou (:

Except for the p
sure to include t

- 6) Identify the reactions with $K > 1$ in the following list and, for each such reaction, identify [8 Mark
the oxidizing agent and calculate the standard cell potential.
- a) $\text{Cl}_2(\text{g}) + 2\text{Br}^-(\text{aq}) \rightarrow 2\text{Cl}^-(\text{aq}) + \text{Br}_2(\text{l})$
b) $\text{MnO}_4^-(\text{aq}) + 8\text{H}^+(\text{aq}) + 5\text{Ce}^{3+}(\text{aq}) \rightarrow 5\text{Ce}^{4+}(\text{aq}) + \text{Mn}^{2+}(\text{aq}) + 4\text{H}_2\text{O}(\text{l})$
c) $2\text{Pb}^{2+}(\text{aq}) \rightarrow \text{Pb}(\text{s}) + \text{Pb}^{4+}(\text{aq})$
d) $2\text{NO}_3^-(\text{aq}) + 4\text{H}^+(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{NO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$ [6 Ma]
- 7) Calculate the standard potential for the half-reaction
- a) $\text{U}^{4+}(\text{aq}) + 4e^- \rightarrow \text{U}(\text{s})$
b) $\text{Ti}^{3+}(\text{aq}) + 3e^- \rightarrow \text{Ti}(\text{s})$
c) $\text{Ce}^{4+}(\text{aq}) + 4e^- \rightarrow \text{Ce}(\text{s})$ [5 M]
- 8) A metal having surface area of 25 cm^2 has been electroplate with Ni using NiSO_4 as an electrolyte. A current of 2700mA was passed for this purpose for an hour. If the density of Ni is 8.9 gm/cm^3 and atomic weight is 58.7 compute the thickness of plating [4 M]
- 9) Identify the hybrid orbitals used by the phosphorus atom in each of the following species and write the molecular structure: (a) PCl_4^+ (b) PCl_6^- (c) PCl_5 (d) PCl_3 [4 M]
- 10) Draw the molecular orbital diagram of HF molecule and specify the characters of the molecular orbitals [5 M]
- 11) Using Lewis structures and VSEPR, predict the shape for each of the following species: [4 M]
(a) sulfur tetrachloride; (b) iodine trichloride; (c) IF_4^- ; (d) xenon trioxide.
- 12) Draw orbital energy diagram for square planer, axially elongated and compressed octahedral geometry [6 M]
- 13) Explain free radical mechanism for the formation of $-\text{[CH}_2\text{-CHCl]}_n-$ [5 M]
- 14) Explain Cossee mechanism for formation of isotactic and syndiotactic polymers. [6 M]
- 15) What is Teflon? Give synthesis, properties and applications of it [6 M]
- 16) List out the difference between Galvanic cell and electrolytic cell [6 M]
- 17) Explain corrosion due to CO_2 and removal of CO_2 from water [6 M]
- 18) A 25 ml of waste water was diluted to 500 ml and equal volume are filled in two BOD bottles. In a blank titration 100 ml of diluted waste water when titrated immediately required 6.1 ml of 0.02 N $\text{Na}_2\text{S}_2\text{O}_3$. 100 ml of incubated sample after 5 days required 3.6 ml of same $\text{Na}_2\text{S}_2\text{O}_3$. Calculate BOD of the waste water. [6 M]
- 19) Differentiate internal and external water treatment [6 M]
- 20) Draw the Lewis structure and identify number of pi bonds in each of the molecule/ion. Where bolded atom is the central atom.
a) CO_3^{2-} b) NO_2 c) SO_4^{2-} d) OSCl_2 [6 M]

****All The Best****

Sem I / PH



Roll no _____

NATIONAL INSTITUTE OF TECHNOLOGY GOA
Farmagudi, Ponda, Goa - 403 401.

Course Name: Elements of Electrical Engineering
Date: 29.04.13

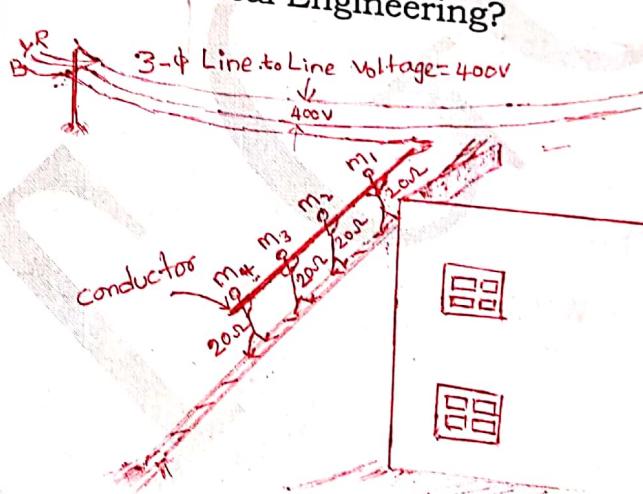
End Semester Examination
Time: 09.30 AM to 12.30 noon Duration: 03hr

May 2013
Course Code: EE100
Max. Marks: 100

Instructions:

1. Answer all questions in same order otherwise invalid for correction.
2. All the sub questions shall be answered in same order at one place otherwise invalid for correction.
3. All the questions deserve neat circuit diagrams, waveforms written in pen only.
4. Solutions deserve neat circuit diagram, proper steps, formulae, digits with 4 decimals.

1. List the Power consuming components seen everyday life. Explain each of its purpose, Human safety. [10M]
2. Explain the laws that govern Electrical Engineering? [10M]
3. For given situation, [10M]



conductor details

Length = 1.0m
 $M_4 \quad M_3 \quad M_2 \quad M_1$

Resistivity of conductors

$$= 1\Omega/m.$$

4 men carrying a conductor to top and came in contact with a charged broken phase.

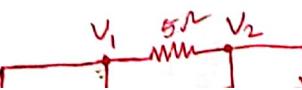
- (a). Draw Electrical circuit diagram, calculate current through M_1, M_2, M_3, M_4 ?
- (b). Calculate line voltages above/below which all 4 may die/survive?

4. Solve the following

(a).

$$2\Omega \quad 4\Omega$$

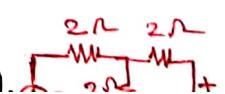
(b).



(c).



(d).





NATIONAL INSTITUTE OF TECHNOLOGY GOA
Farmagudi, Ponda, Goa - 403 401.

Roll no _____

Course Name: Elements of Electrical Engineering
Date: 29.04.13

End Semester Examination

Time: 09.30 AM to 12.30 noon Duration: 03hr

May 2013

Course Code: EE100

Max. Marks: 100

Instructions:

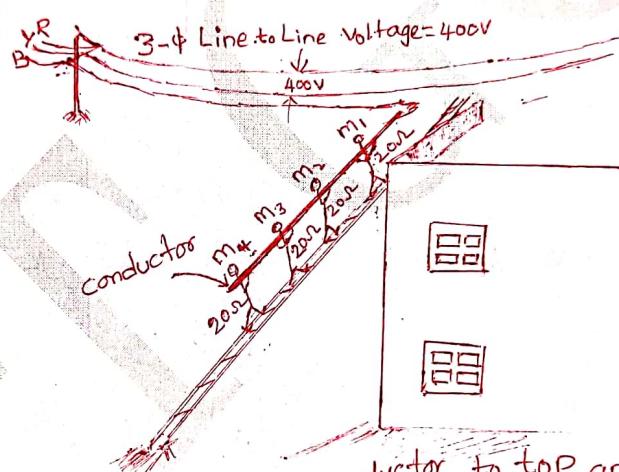
1. Answer all questions in same order otherwise invalid for correction.
2. All the sub questions shall be answered in same order at one place otherwise invalid for correction.
3. All the questions deserve neat circuit diagrams, waveforms written in pen only.
4. Solutions deserve neat circuit diagram, proper steps, formulae, digits with 4 decimals.

1. List the Power consuming components seen everyday life. Explain each of its purpose, Human safety. [10M]
2. Explain the laws that govern Electrical Engineering? [10M]
3. For given situation, [10M]

conductor details

Length
 $= 10m$ $= 10m$ $= 10m$ $= 10m$
 m_4 m_3 m_2 m_1

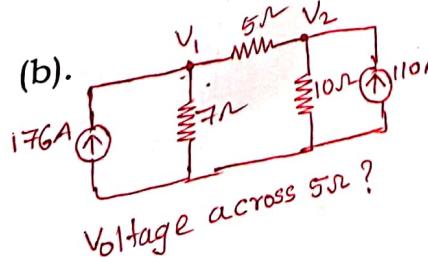
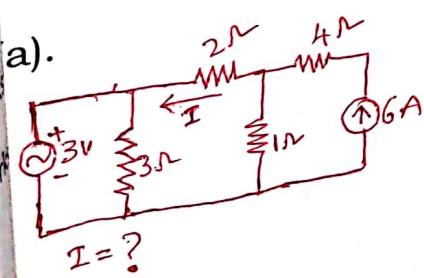
Resistivity of conductors
 $= 1\Omega/m$



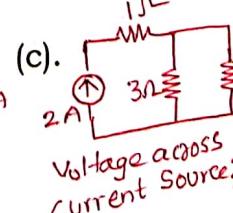
4 men carrying a conductor to top and
came in contact with a charged broken phase.

- (a). Draw Electrical circuit diagram, calculate current through M_1, M_2, M_3, M_4 ?
- (b). Calculate line voltages above/below which all 4 may die/survive?

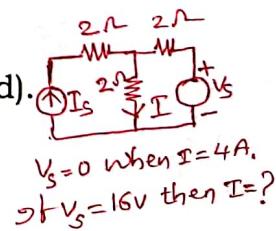
4. Solve the following



Voltage across 5Ω ?
Voltage across 10Ω ?



Voltage across current source?

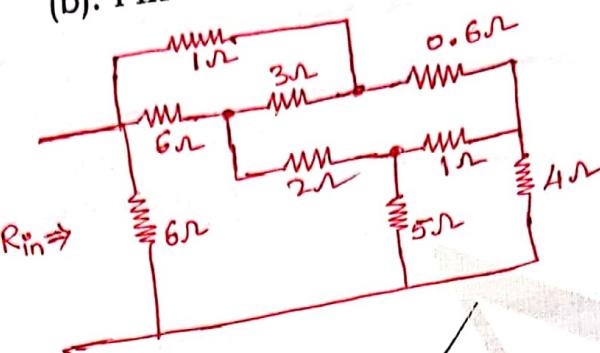


$V_5 = 0$ when $I = 4A$.
 $\Rightarrow V_5 = 16V$ then $I = ?$

[5M]

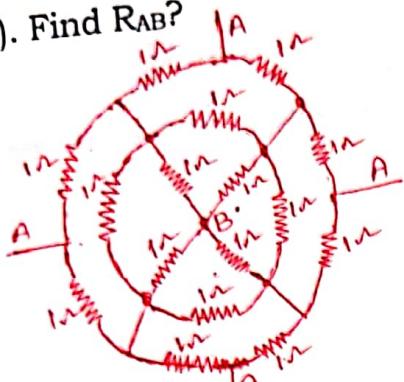
[5M]

(b). Find R_{in} ?

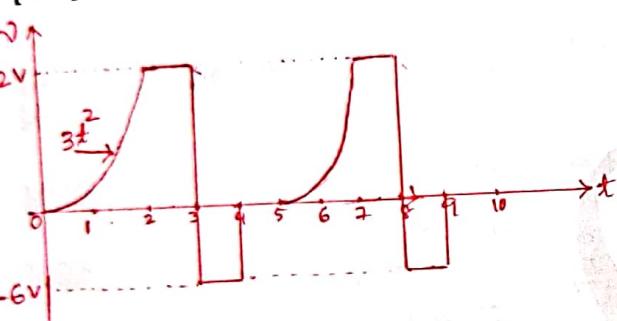


[5M]

5. (a). Find R_{AB} ?



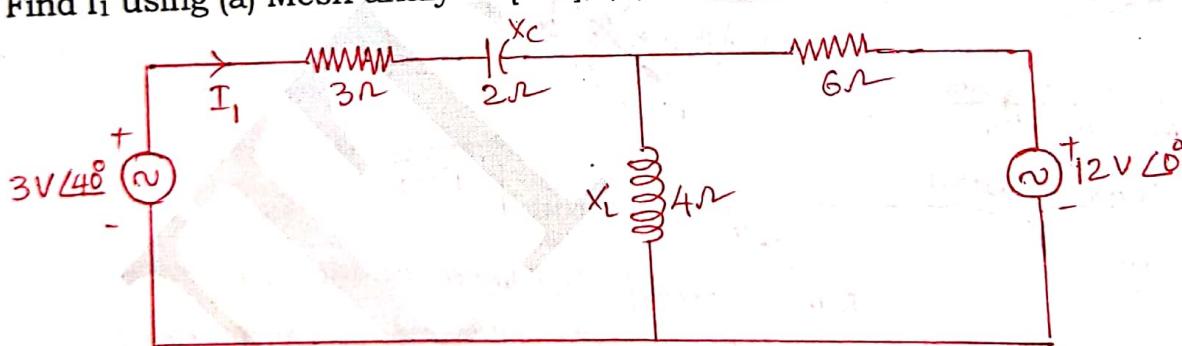
6. (a). Find V_{avg}, V_{RMS} for given profile? (b).



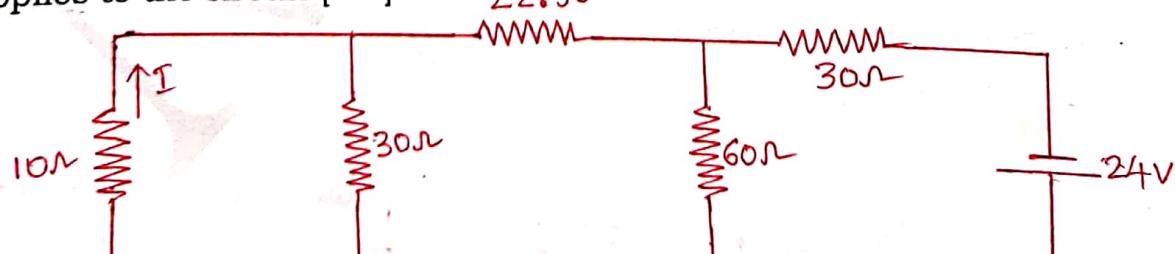
(i). Find P, Q, S across each element?

(ii). Find Z_s, I_s and pf ?

7. Find I_1 using (a) Mesh analysis [5M], (b) Superposition [5M]



8. (a). Find I using Thevenin's Theorem [5M], (b). Show that Reciprocity theorem applies to the circuit [5M]?



NATIONAL INSTITUTE OF TECHNOLOGY, GOA**[Mentor Institute – NITK, Surathkal]****Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.****End-Semester Examination****PH-100 Physics****Date: 29/11/2010****Time: 10.00AM-1.00PM****Duration - 3 Hours****Max. Marks - 100****Instructions:**

1. All questions are compulsory and carry 20 marks each.
2. Assume additional data if required.
3. Draw diagrams wherever required.

Physical Constants:

Electron mass	= 9.11×10^{-31} kg
Electron charge	= 1.6×10^{-19} C
Planck's constant	= 6.63×10^{-34} J.s
Boltzmann constant	= 1.38×10^{-23} J/K
Permittivity of free space	= 8.854×10^{-12} Fm ⁻¹

Q.1.

- a) A particle of rest mass m_0 has kinetic energy K, which is not negligible in comparison to the rest mass energy $m_0 c^2$. Show that the de Broglie wavelength in this case, is given by the equation $\lambda = h / [p + (m_0 c^2)]^{1/2}$. [05]
- b) A particle is confined to one dimensional infinite potential well of width 0.2×10^{-9} m. It is found that when the energy of the particle is 230 eV, its eigen function have five antinodes. Find the mass of the particle. [05]
- c) What are matter waves? Enumerate any four properties of matter waves. Briefly describe an experiment which confirms their existence. [10]

Q.2.

- a) Obtain an expression for electrical conductivity of a metal on the basis of classical free electron theory. [05]
- b) A material has resistivity of 1.54×10^{-3} Ωm at room temperature. There are 5.8×10^{28} electrons/m³. The Fermi energy of the conductor is 5.5 eV. Calculate (i) the velocity of electrons with Fermi energy & (ii) the mean free path of electrons. [05]
- c) Give an account of Fermi factor & discuss the variation of Fermi energy with temperature. Describe how quantum free electron theory has been successful in overcoming the failures of classical free electron theory. [10]



NATIONAL INSTITUTE OF TECHNOLOGY, GOA

[Mentor Institute – NITK, Surathkal]

Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.

End-Semester Examination

PH-100 Physics

Date: 29/11/2010

Time: 10.00AM-1.00PM

Duration - 3 Hours

Max. Marks - 100

Instructions:

1. All questions are compulsory and carry 20 marks each.
2. Assume additional data if required.
3. Draw diagrams wherever required.

Physical Constants:

Electron mass	=	9.11×10^{-31} kg
Electron charge	=	1.6×10^{-19} C
Planck's constant	=	6.63×10^{-34} J.s
Boltzmann constant	=	1.38×10^{-23} J/k
Permittivity of free space	=	8.854×10^{-12} Fm ⁻¹

Q.1.

a) A particle of rest mass m_0 has kinetic energy K, which is not negligible in comparison to the rest mass energy $m_0 c^2$. Show that the de Broglie wavelength in this case, is given by the equation $\lambda = hc/\sqrt{K(K + m_0 c^2)}$. [05]

b) A particle is confined to one dimensional infinite potential well of width 0.2×10^{-9} m. Find that when the energy of the particle is 230 eV, its eigen function have five nodes. Find the mass of the particle. [05]

c) What are matter waves? Enumerate any four properties of matter waves. Briefly describe an experiment which confirms their existence. [10]

Q.2.

a) Obtain an expression for electrical conductivity of a metal on the basis of classical free electron theory. [05]

b) A material has resistivity of 1.54×10^{-3} Ωm at room temperature. There are 5.8×10^{28} electrons/m³. The Fermi energy of the conductor is 5.5 eV. Calculate (i) the velocity of electrons with Fermi energy & (ii) the mean free path of electrons. [05]

c) Give an account of Fermi factor & discuss the variation of Fermi energy with temperature. Describe how quantum free electron theory has been successful in overcoming the failures of classical free electron theory. [10]



Sem I / PH

Reg. No.

NATIONAL INSTITUTE OF TECHNOLOGY, GOA
[Mentor Institute - NITK, Surathkal]

Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.
End-Semester Examination
PH-100 Physics

Date: 29/11/2010

Time: 10.00AM-1.00PM

Duration - 3 Hours
Max. Marks - 100

Instructions:

1. All questions are compulsory and carry 20 marks each.
2. Assume additional data if required.
3. Draw diagrams wherever required.

Physical Constants:

Electron mass	=	9.11×10^{-31} kg
Electron charge	=	1.6×10^{-19} C
Planck's constant	=	6.63×10^{-34} J.s
Boltzmann constant	=	1.38×10^{-23} J/K
Permittivity of free space	=	8.854×10^{-12} Fm ⁻¹

Q.1.

- a) A particle of rest mass m_0 has kinetic energy K, which is not negligible in comparison to the rest mass energy $m_0 c^2$. Show that the de Broglie wavelength in this case is given by the equation $\lambda = hc/\sqrt{K(K + m_0 c^2)}$. [05]
- b) A particle is confined to one dimensional infinite potential well of width 0.2×10^{-9} m. It is found that when the energy of the particle is 230 eV, its eigen function have five antinodes. Find the mass of the particle. [05]
- c) What are matter waves? Enumerate any four properties of matter waves. Briefly describe an experiment which confirms their existence. [10]

Q.2.

- a) Obtain an expression for electrical conductivity of a metal on the basis of classical free electron theory. [05]
- b) A material has resistivity of 1.54×10^{-3} Ωm at room temperature. There are 5.8×10^{28} electrons/m³. The Fermi energy of the conductor is 5.5 eV. Calculate (i) the velocity of electrons with Fermi energy & (ii) the mean free path of electrons. [05]
- c) Give an account of Fermi factor & discuss the variation of Fermi energy with temperature. Describe how quantum free electron theory has been successful in overcoming the failures of classical free electron theory. [10]



Cosx

Reg. No.

--	--	--

NATIONAL INSTITUTE OF TECHNOLOGY, GOA

[Mentor Institute – NITK, Surathkal]

Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.**End-Semester Examination****Engg. Mathematics-I****Date : 26/11/2010****Time: 10.00AM-1.00PM****Duration - 3 Hours****Max. Marks - 100****Note: Answer ALL the questions****Q1.****a) Discuss the convergence of the following series**

$$\text{i) } \sum_{n=1}^{\infty} \frac{n^3 + 1}{2^n + 5} \quad \text{ii) } \sum_{n=1}^{\infty} \frac{1}{\sqrt{n} + \sqrt{n+1}} \quad (6)$$

b). State Cauchy's root test. Use it to find the interval of convergence of the series

$$\sum_{n=1}^{\infty} \left(\frac{n}{n+1} \right)^{n^2} x^n \quad (4)$$

Q2.**a) Find the Maclaurian series expansion of $\log_e(1-x^2)$ upto powers of x^4** **State the region in which it is valid.**

b) Evaluate i) $\lim_{x \rightarrow 0} \frac{e^x - e^{\sin x}}{x - \sin x}$ ii) $\lim_{x \rightarrow 0} (1 + \sin x)^{\cosec x}$

c) Find the Fourier series expansion of $f(x) = x \sin x$ in the interval $-\pi \leq x \leq \pi$.
Hence deduce the sum of the series $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \frac{1}{7.9} \dots \dots \quad (8)$
d) Find the half range Fourier Sine series of $f(x) = x - 1$ in the interval $(0, 1)$. (5)**Q3. a) If $y = e^{\alpha \sin^{-1} x}$ prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2 + \alpha^2)y_n = 0$ (7)****b) Assuming the validity of differentiating under the integral sign prove that**

$$\int_0^{\pi} \frac{\log_e(1 + \alpha \cos x)}{\cos x} dx = \pi \sin^{-1} \alpha \quad (8)$$



Reg.No.

--	--	--

NATIONAL INSTITUTE OF TECHNOLOGY, GOA**[Mentor Institute – NITK, Surathkal]****Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.****End-Semester Examination****Engg. Mathematics-I****Date : 26/11/2010****Time: 10.00AM-1.00PM****Duration - 3 Hours****Max. Marks - 100****Note: Answer ALL the questions****Q1.****a) Discuss the convergence of the following series**

$$\text{i)} \sum_{n=1}^{\infty} \frac{n^3 + 1}{2^n + 5} \quad \text{ii)} \sum_{n=1}^{\infty} \frac{1}{\sqrt{n} + \sqrt{n+1}} \quad (6)$$

b). State Cauchy's root test. Use it to find the interval of convergence of the series

$$\sum_{n=1}^{\infty} \left(\frac{n}{n+1} \right)^{x^n} \quad (4)$$

Q2.**i) Find the Maclaurian series expansion of $\log_e(1-x^2)$ upto powers of x^4 .****State the region in which it is valid. (6)**

$$\text{b) Evaluate i)} \lim_{x \rightarrow 0} \frac{e^x - e^{\sin x}}{x - \sin x} \quad \text{ii)} \lim_{x \rightarrow 0} (1 + \sin x)^{\cosec x} \quad (6)$$

c) Find the Fourier series expansion of $f(x) = x \sin x$ in the interval $-\pi \leq x \leq \pi$.

Hence deduce the sum of the series $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \frac{1}{7.9} \dots \dots \dots \quad (8)$

d) Find the half range Fourier Sine series of $f(x) = x - 1$ in the interval $(0,1)$. (5)**Q3. a) If $y = e^{\alpha \sin^{-1} x}$ prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2 + \alpha^2)y_n = 0$ (7)****b) Assuming the validity of differentiating under the integral sign prove that**

$$\int_0^\pi \frac{\log_e(1 + \alpha \cos x)}{\cos x} dx = \pi \sin^{-1} \alpha \quad (8)$$



Q4. a) Find the angle of intersection of the curves $r=a(1+\cos\theta)$ and $r=3a\cos\theta$ (5)

b) Find the radius of curvature at any point of the cycloid $x=a(\theta-\sin\theta)$, $y=a(1-\cos\theta)$ (5)

Q5.a) Verify Rolle's theorem for $f(x)=e^x(\sin x - \cos x)$ in $\left(\frac{\pi}{4}, \frac{5\pi}{4}\right)$ (5)

b) Obtain the reduction formula for $\int \sin^n 2x dx$ (5)

Q6.a) If $u=f(x-y, y-z, z-x)$ prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$ (5)

b) If $f(x,y)=g(u,v)$ and $u=x^2-y^2$ and $v=2xy$ prove that $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} = 4(x^2 + y^2) \left(\frac{\partial^2 g}{\partial u^2} + \frac{\partial^2 g}{\partial v^2} \right)$ (8)

c) If $u = \sin^{-1}(\sqrt{x^2 + y^2})$ prove that $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = -1$ (5)

d) If $u = \frac{x}{y-z}$, $v = \frac{y}{z-x}$, $w = \frac{z}{x-y}$ Prove that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = 0$ (6)

e) Find the maximum of $u=xyz$ when $xy+yz+zx=a$ (6)

NATIONAL INSTITUTE OF TECHNOLOGY, GOA**[Mentor Institute – NITK, Surathkal]****Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.****End-Semester Examination****ME101- Engineering Graphics****Date: 25/11/2010****Time: 10.00AM-1.00PM****Duration - 3 Hours****Max. Marks - 100****Instructions:**

1. Answer All the questions.
2. Line work and dimensioning will carry weightage.
3. Assume missing data if any.

1. A line PQ, 100mm long is inclined at 45° to the HP and 30° to VP. Its end P is in the second quadrant and Q in fourth quadrant. A point R on PQ, 40mm from P is in both the planes. Draw the projections of PQ. [14]
2. A line AB is in the first quadrant. End A is 20mm above HP and 10mm in front of VP. The distance between the end projectors is 50mm. The top view of AB measures 65mm and the line AB is inclined at 30° to HP. Draw the projections and locate its traces. [14]

An equilateral triangle of 75mm side has a circle inscribed in it. Draw the projection of the figure when the plane is vertical and inclined at 30° to the VP and one of the sides of the triangle is inclined at 45° to the HP.

[14]

4. A hexagonal pyramid of base of side 30mm long and axis 60mm is resting on one of its base edges on the ground. This edge makes 30° to the VP and the face containing this edge makes 45° to HP. Draw its projections. [14]
5. A cylinder 65mm diameter and axis 90mm long is cut two section planes; one parallel to HP and the other inclined at 30° to HP. Both the cutting planes intersect the axis at a distance of 50mm from the base. Draw the front view, sectional top view and true shape of the section, given that the solid is resting on HP. [16]

(7)

(8)



Sem I/CY

Reg.No.

NATIONAL INSTITUTE OF TECHNOLOGY, GOA

[Mentor Institute – NITK, Surathkal]

Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.

End-Semester Examination

CY-100 Chemistry

**Date: 24/11/2010
Time: 10.00AM-1.00PM**

**Duration - 3 Hours
Max. Marks - 100**

Note: Answer ALL the questions

Q.1.

- a) Define the term 'Electrode Potential'. State and explain the conditions which affect the electrode potential. Derive the equation for expressing the electrode potential in a non-standard state. [05]
- b) With the help of a neat labeled diagram explain the type of experimental set up required for determining the standard electrode potential and write the equations involved therein. [05]

Q.2.

- a) With the help of a neat labeled diagram explain the construction of a pH electrode and derive the relationship between pH and Ecell. [05]
- b) With help of neat labeled diagram explain the construction and working of Zn-Air battery. [05]
- a) Draw the basic setup for an Electroplating process and Electroless plating process. Outline the basic principle, type of surface requirement, surface preparation steps involved in above processes. [05]
- b) Explain how corrosion can be controlled by modifying the environmental conditions. [05]

Q.4.

- a) With the help of a neat labeled diagram explain the Electrodialysis process for desalination of water. [05]
- b) Define the term 'Hardness of water'. Outline its classification and explain any one internal treatment method for softening water in Boilers. [05]

Q.5.

- a) Give the carbon content range in Petrol and Diesel fractions obtained. Explain how these fuels are rated. [05]
- b) Outline the Proximate analysis of coal. [05]



Sem I/CV

Reg.No.

NATIONAL INSTITUTE OF TECHNOLOGY, GOA

[Mentor Institute – NITK, Surathkal]

Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.

End-Semester Examination

CV-100 Engineering Mechanics

Date: 22/11/2010

Time: 10.00AM-1.00PM

Duration – 3 Hours

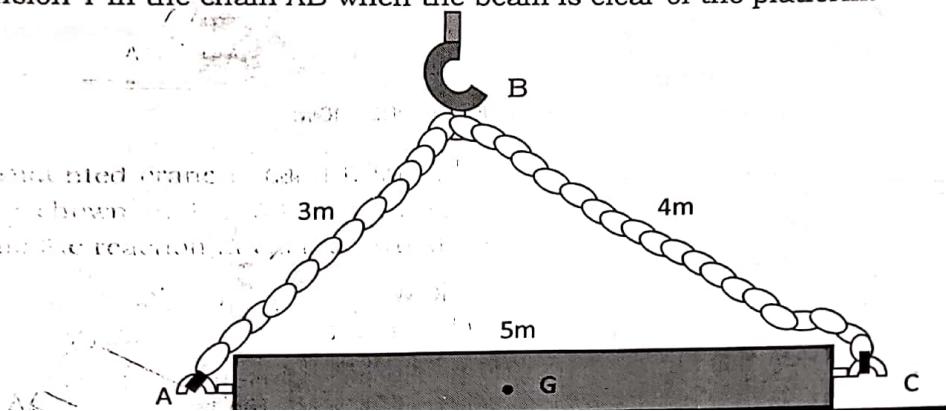
Max. Marks – 100

Note: 1. Answer ALL the questions

2. Unless otherwise specified assume suitable data

3. Draw legible, neat and sufficiently big FBDs

1. The uniform steel beam has a mass of 600kg and is to be lifted from the hook at B with the two chains, AB of length 3m and CB of length 4m as shown in figure 1. Determine the tension T in the chain AB when the beam is clear of the platform. [10]





8. For the Lamina shaded as shown in figure.8, calculate the radius of gyration about the horizontal centroidal axis. [10]

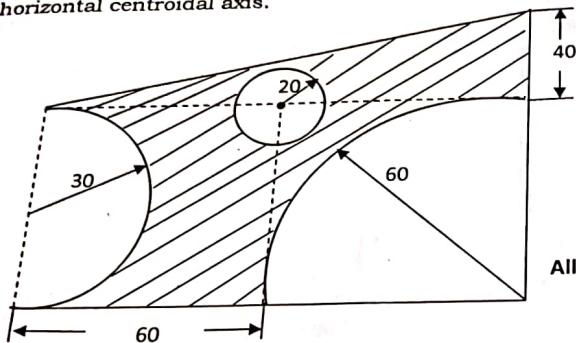


Figure.8

9. A Compound tube consists of a steel tube 150mm internal diameter and 10mm thickness and outer brass tube 170mm internal diameter and 10mm thickness , length 150mm and subjected to axial load of 1000kN. Find the stresses in each tube and the corresponding deformation. Take $E_s = 2 \times 10^5 \text{ N/mm}^2$, $E_b = 1 \times 10^5 \text{ N / mm}^2$. [10]

10. Answer the following Questions.

[5x5=25]

- What is FBD? What are the advantages of drawing neat/clear and legible FBDs [Write seven points].
- What are the seven assumptions made in the design and analysis of Trusses.
- Write short notes on different types of supports, with the help of neat sketches.
- Prove that second moment of area for a semi circle is $\frac{\pi D^4}{128}$, about the diametral axis.
- Neatly draw the stress-strain diagram for M.S. rod subjected to tension test, and explain briefly with the help of salient points.



Sem I / Engg. Graphics

NATIONAL INSTITUTE OF TECHNOLOGY, GOA
[Formerly known as
Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.

I Semester Examination October - 2010

ENGINEERING GRAPHICS

I - semester

Time - 10.00 - 12.00

Max. Marks - 20

Date: 16-10-2010

Duration - 2 hrs

INSTRUCTIONS:

- i Line work and dimensioning carry weightage.
- ii Assume missing data if any.

- Q1] The front view and top view of a line AB are 65 mm and 56 mm long respectively. The midpoint of the line is 38 mm in front of VP and 30 mm above HP. End A is 10mm in front of VP and nearer to it. End B is nearer to HP. Draw the projections of the line and find its true length and true inclinations. (5)
- Q2] The top view of a line PQ, 60 mm long, measures 40 mm. Its end P is 40 mm in front of the VP and 12 mm above HP. End Q is 12 mm in front of the VP and is below the HP. Draw its front elevation and determine its inclinations with the HP and VP. (5)
- Q3] Draw the projections of a rhombus having diagonals 125 mm and 50 mm long, the smaller diagonal of which is parallel to both the principal planes, while the other is inclined at 30° to the HP. (5)
- Q4] A regular hexagon of 25 mm sides is resting on one of its edges on HP such that it is parallel to and 25 mm in front of the VP. The side opposite to this edge rests in VP. Draw its projection and find the angle made by the plane with the HP. (5)



Sem I / Mathematics I

NATIONAL INSTITUTE OF TECHNOLOGY, GOA
[Mentor Institute – NITK, Surathkal]
Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.

Mid Semester Examination October – 2010
MATHEMATICS-1

I - semester
Time – 10.00 - 12.00

Max. Marks – 50

Date: 13-10-2010
Duration – 2 hrs

Q.No 1. Show that the P-Series $\sum_{n=1}^{\infty} \frac{1}{n^p}$ converges for $p > 1$ and diverges for $p < 1$.

(5)

Q.No 2. Determine convergence or divergence of a) $\sum_{n=1}^{\infty} n \sin\left(\frac{1}{n}\right)$ b) $\sum_{n=1}^{\infty} \left(\frac{1}{\sqrt{n}} - \frac{1}{\sqrt{n+1}} \right)$

(4)

Q.No 3. Find the interval of convergence of a) $\sum_{n=1}^{\infty} \frac{x^n}{\sqrt{n^2+1}}$ b) $\sum_{n=1}^{\infty} \sqrt{n} \frac{x^n}{3^n}$

(6)

Q.No 4. Evaluate a) $\lim_{x \rightarrow 0} \frac{\tan x - \sin x}{x^3}$ b) $\lim_{x \rightarrow \frac{1}{2}} \frac{\cos^2 \pi x}{e^{2x} - 2ex}$

(6)

Q.No 5. Prove that $e^{\sin x} = 1 + x + \frac{x^2}{2} - \frac{x^4}{8} + \dots$

(5)

Q.No 6. Find the Fourier series of $f(x) = |x|$, $-\pi < x < \pi$. Hence deduce that

$$\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \dots$$

(6)

Q.No 7. Find the half range Cosine series of $f(x) = 2x-1$ over $(0, 2)$.

(6)

Q.No 8. If $y = e^{\tan^{-1} x}$ then prove that $(1+x^2)y_{n+2} + [2(n+1)x+1]y_{n+1} + n(n+1)y_n = 0$

(5)

Q.No 9. Show that $\int_0^{\pi/2} \frac{\log_e(1+a \sin^2 x)}{\sin^2 x} dx = (\sqrt{a+1}-1)\pi$

(5)

Q.No 10. Find the radius of curvature at any point of the cycloid $x=a(\theta-\sin\theta)$, $y=a(1-\cos\theta)$.

(4)



Sem I / cy

NATIONAL INSTITUTE OF TECHNOLOGY, GOA
[Mentor Institute – NITK, Surathkal]
Goa College of Engineering Campus, Farmagudi, Ponda, Goa - 403 401.

Mid Semester Examination October – 2010

CY100: Chemistry

I - semester

Max. Marks – 50

Date: 12-10-2010

Time – 10.00 - 12.00

Duration – 2 hrs

Q.1. Write the Nernst Equation for the following system and determine its Electrode Potential.

$\text{Ni}/\text{Ni}^{2+} \text{ at } 25^\circ\text{C}$. (Data Given : $E^\circ_{\text{Ni}^{2+}} = -0.23 \text{ V}$). (3mks)

Q.2. A fuel weighing 0.85 g was tested in a Bomb Calorimeter. The mass of water taken in the calorimeter was 2000g. Water equivalent of the calorimeter is 540 g. The difference in the initial and final temperature is 1.9°C . Its elemental analysis showed 90% C, 3.6% H and 1.2 % O. Calculate the Net Calorific value. (4mks)

Q.3. Describe any two methods by which corrosion can be quantified. (4 mks)

Q.4. A water sample was analyzed for Hardness and found to contain the following salts: CaHCO_3 (75 ppm), MgCl_2 (100ppm), CaSO_4 (50 ppm), $\text{Ca}_3(\text{PO}_4)_2$ (44ppm) all values are in CaCO_3 equivalents.

i) Determine the total hardness of the water sample.

ii) Explain any two internal softening methods that can be used for water softening in boilers. (7mks)

Q.5. With the help of a neat labeled diagram explain the process of Flash Evaporation for desalination of water. (3mks)

Q.6. State and explain any two Boiler troubles. (4mks)

Q.7. Explain any two types of corrosion phenomenon occurring due to differential Oxygen concentration across its surface and how best this can be avoided. (6mks)

Q.8. Gasoline is one of the major fractions of crude oil refining accounting for around 20 % of the total fractions obtained but its demand is

Mid Semester Examination October - 2010

First Semester - Engineering Physics
Time - 2 hrs

Date: 11-10-2010
Max. Marks - 50

Instructions:

1. Answer any **Two Full** questions
2. All questions carry 25 marks
3. Assume additional data if required
4. Draw diagrams whenever required

Physical Constants:

Electron mass	=	9.11×10^{-31} kg
Electron charges	=	1.6×10^{-19} C
Planck's constant	=	6.63×10^{-34} J.s.
Velocity of light	=	3×10^8 m/s
Boltzmann constant	=	1.38×10^{-23} J/k
Avogadro's number	=	6.025×10^{23} /mole
One electron volt	=	1.602×10^{-19} J

Q.1.

- a) Assuming the time independent Schrodinger wave equation, discuss the solution for a particle in one dimensional potential well of infinite height. (6)
- b) Obtain an expression for the density of states for conduction electrons for unit volume of metal. (4)
- c) Explain the Heisenberg uncertainty principle with one example. Discuss its physical significance. (4)
- d) Calculate the free electron concentration, mobility & drift velocity of electrons in a certain metallic wire of length 5 m and resistance 60 milli ohms if it carries a current of 15 A. Assume that each metal atom contributes 3 free electrons for conduction. Given for the metallic wire - resistivity = $2.7 \times 10^{-8} \Omega \text{m}$, atomic weight = 26.98 & density = $2.7 \times 10^3 \text{kg/m}^3$. (5)
- e) What is Compton scattering? How does it account for particle nature of a radiation? Calculate the change in wavelength, scattering at an angle of 60° to the incident direction. (6)

