

**B. Tech. I Semester
ODD SEMESTER
MAJOR EXAMINATION 2019 - 2020**

Subject Name: : Engineering Mathematics-I

Time: 3 Hrs.

Max. Marks: 50

Note: Attempt all questions. Each question carry equal marks.

1. Attempt any five parts of the following: (5×2 = 10)

- (a) If $y = \frac{\log x}{x}$, then show that $y_n = \frac{(-1)^n n!}{x^{n+1}} \left[\log x - 1 - \frac{1}{2} - \frac{1}{3} - \dots - \frac{1}{n} \right]$, where y_n is the n^{th} differential coefficient of y w.r.t. x .
- (b) If $u = \frac{yz}{x}$, $v = \frac{zx}{y}$ and $w = \frac{xy}{z}$, then show that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = 4$.
- (c) Expand $x^2y + 3y - 2$ in powers of $(x - 1)$ and $(y + 2)$ using Taylor's theorem.
- (d) Find the shortest and longest distance from the point $(1, 2, -1)$ to the sphere $x^2 + y^2 + z^2 = 24$.
- (e) The product of two eigen values of the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ is 16. Find the third eigen value. Find the sum of these eigen values.
- (f) For what values of k , the equations $x + y + z = 1$, $2x + y + \frac{yz}{4k} = k$, $4x + y + 10z = k^2$ has
 (i) Infinite no. of solutions (ii) Unique solution
- (g) Find the value of a if rank of the matrix $A = \begin{bmatrix} 4 & 4 & -3 & 1 \\ 1 & 1 & -1 & 0 \\ a & 2 & 2 & 2 \\ 9 & 9 & a & 3 \end{bmatrix}$ is 3.

2. Attempt any two parts of the following: (2×5 = 10)

- (a) (i) Find the smaller of the areas bounded by curves $y = 2 - x$ and $x^2 + y^2 = 4$ using double integration.
 (ii) Using change of order of integration, evaluate

$$\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{x}{\sqrt{x^2+y^2}} dy dx$$

- (b) (i) Find the volume of the tetrahedron bounded by the plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ and the coordinate planes.
 (ii) If l, m and n are all Positive, then show that the triple integral

$$\iiint_V x^{l-1} y^{m-1} z^{n-1} dx dy dz = \frac{\Gamma l \Gamma m \Gamma n}{\Gamma(l+m+n+1)},$$

where V is the region $x \geq 0, y \geq 0, z \geq 0$ and $x + y + z \leq 1$.

- (c) Show that

(i) $\beta\left(m, \frac{1}{2}\right) = 2^{2m-1} \beta(m, m).$

(ii) $\int_0^\infty x^n e^{-ax^2} dx = \frac{1}{2a^{n+1}} \Gamma\left(\frac{n+1}{2}\right).$

3. Attempt any two parts of the following:

(2×5 = 10)

(a) Evaluate

(i) $\int_0^1 \frac{x^3 - 2x^4 + x^5}{(1+x)^7} dx$

(ii) $\int_0^1 \log(\Gamma x) dx$

(b) Evaluate $\iint_A \frac{dxdy}{\sqrt{xy}}$, using the substitutions $x = \frac{u}{1+v^2}$, $y = \frac{uv}{1+v^2}$, where A is bounded by $x^2 + y^2 - x = 0$ and $y \geq 0$.(c) Find the area and mass contained in the first quadrant enclosed by the curve $\left(\frac{x}{a}\right)^\alpha + \left(\frac{y}{b}\right)^\beta = 1$, where $\alpha > 0, \beta > 0$ and density at any point (x, y) is $k\sqrt{xy}$.

4. Attempt any two parts of the following:

(2×5 = 10)

(a) Verify Green's theorem in a plane for $\int_C e^{-x} (\sin y dx + \cos y dy)$, C being the rectangle with vertices $(0, 0)$, $(\pi, 0)$, $(\pi, \frac{\pi}{2})$ and $(0, \frac{\pi}{2})$.(b) (i) Evaluate line integral $\int_C (y^2 dx - x^2 dy)$ around the triangle whose vertices are $(1, 0)$, $(0, 1)$ and $(-1, 0)$ in the positive sense.
(ii) Find the maximum value of the directional derivative of $\phi = x^3yz$ at the point $(1, 4, 1)$.(c) Evaluate $\int_S \vec{F} \cdot \hat{n} dS$ if $\vec{F} = yz\hat{i} + zx\hat{j} + xy\hat{k}$ and S is the part of surface $x^2 + y^2 + z^2 = 1$ which lies in the first octant.

5. Attempt any two parts of the following:

(2×5 = 10)

(a) Verify Gauss divergence theorem for $\vec{F} = a(x+y)\hat{i} + a(y-x)\hat{j} + z^2\hat{k}$ over the region bounded by the upper hemisphere $x^2 + y^2 + z^2 = a^2$ and the plane $z = 0$.(b) Verify Stokes theorem for $F = (x^2 - y^2)\hat{i} + 2xy\hat{j}$ in the rectangular region in the $x-y$ plane bounded by the lines $x = 0, x = a, y = 0, y = b$.(c) (i) Given the vector field $\vec{V} = (x^2 - y^2 + 2xz)\hat{i} + (xz - xy + yz)\hat{j} + (z^2 + x^2)\hat{k}$. Find $\text{curl } \vec{V}$ and also show that vectors given by $\text{curl } \vec{V}$ at points $(1, 2, -3)$ and $(2, 3, 12)$ are orthogonal.(ii) Show that $\text{div}(\text{grad } r^n) = n(n+1)r^{n-2}$, where $r^2 = x^2 + y^2 + z^2$. Hence show that $\nabla^2 \left(\frac{1}{r}\right) = 0$.

**B. Tech.
(SEMESTER -Ist)
MAJOR EXAMINATION 2019 - 2020
Subject Name: Engineering Physics-I**

Time: 3 Hrs.**Max. Marks: 50****Note: Attempt all questions. Each question carry equal marks.**

1. Attempt any five parts of the following: $(5 \times 2 = 10)$

- (a) What was the objective of conducting the Michelson – Morely experiment? Describe the experiment.
- (b) Find the speed of 0.1 MeV electrons according to the classical and relativistic mechanics.
- (c) Calculate the amount of work done to increase the speed of an electron from 0.6c to 0.8c. Given that the rest-mass energy of electron = 0.511 MeV.
- (d) Using the postulates of Special Theory of Relativity, derive the Lorentz Transformation equations.
- (e) Derive the time dependent Schrodinger wave equation.
- (f) An electron is bound in one dimensional potential box which has the width 2.5×10^{-10} m. assuming the height of the box to be infinite, calculate the two lowest permitted energy values of the electron.
- (g) Prove that the de- Broglie wavelength of a particle of rest mass m_0 and charge q, accelerated by a potential difference V is given by

$$\lambda = \frac{h}{\sqrt{(2m_0qV(1+qV/2m_0c^2))}}$$

2. Attempt any two parts of the following: $(2 \times 5 = 10)$

- (a) Why the center of Newton's Rings is dark in case of thin air film? What will happen if
 - (i) A little drop of water is introduced between the lens and glass plate
 - (ii) A plan mirror is used instead of glass plate
 - (iii) White light is used
- (b) On placing a thin sheet of mica of thickness 1.2×10^{-6} cm in the path of one of the interfering beams in a biprism experiment, it is found that the central bright band shifts a distance equal to the width of a bright fringe. Calculate the refractive index of mica ($\lambda = 6 \times 10^{-5}$ cm).
- (c) Calculate the minimum number of lines in a grating which will just resolve the lines of wavelengths 5890 \AA^0 and 5896 \AA^0 in the second order.

3. Attempt any two parts of the following: $(2 \times 5 = 10)$

- (a) Obtain the expression for the resolving power of grating.
- (b) A sugar solution in a tube of length 20 cm produces optical rotation of 13^0 . The solution is diluted to one-third of its previous concentration. Find the optical rotation produced by 30 cm long tube containing the diluted solution.
- (c) Describe the construction of Nicol prism and show how it can be used as a polarizer or an analyzer.

4.

Attempt any two parts of the following:

($2 \times 5 = 10$)

- (a) What are the essential requirements for laser action? Discuss the important features of stimulated emission of radiations.
- (b) What is holography? Explain recording and reconstruction of a hologram. List some important applications of holography.
- (c) An optical fiber core and its cladding have refractive indices of 1.545 and 1.495, respectively. Calculate the critical angle ϕ_c , the acceptance angle $\phi_{c(max)}$, and numerical aperture.

5.

Attempt any two parts of the following:

($2 \times 5 = 10$)

- (a) Describe the construction and working of Ruby Laser. Point out the limitations of Ruby laser.
- (b) Describe the Propagation Mechanism of optical signals through optical fiber with suitable ray diagram.
- (c) An optical fiber has a core refractive index $n_1 = 1.36$ and the relative difference in index $\Delta = 0.025$. find the
 - (i) Refractive index of cladding, i.e. n_2
 - (ii) Numerical aperture
 - (iii) Acceptance angle.

SUBJECT CODE -BAS 03

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BACHELOR OF TECHNOLOGY FIRST YEAR

ODD SEMESTER

MAJOR EXAMINATION2019--2020

PROFESSIONAL COMMUNICATION

Time- 3 Hours

Maximum Marks- 50

Note: Attempt all questions. Each question carries equal marks.

Q.1. Attempt any five parts of the following. (5 x 2=10)

- a)Describe the various aspects of Kinesics in detail.
- b)What is formal Communication? Elaborate along with its characteristics.
- c)Explain Chronological order of paragraph development and develop a paragraph in the mentioned order.
- d)What is interpersonal level of communication? Elucidate in detail.
- e)Differentiate between Diagonal and grapevine communication with their flow chart.
- f)Discuss the British numeral system and compare it with American numeral system.
- g)What are the key features of a language that make it a convenient medium of communication?

Q.2. Attempt any two parts of the following. (2 x 5 = 10)

- a)What do you mean by Thesis and how it differs from a Dissertation?
- b)Prepare your Resume for the post of an assistant Engineer in the General Manager of Reliance Telecom with a covering letter.
- c)Mention the various formats of letter writing and discuss one in a detail with the sketch of the layout.

Q.3. Attempt any two parts of the following.

(2 x 5 = 10)

- a) Write a voluntary special report to the Registrar, MMMUT, Gorakhpur, about the 6th convocation of MMMUT, Gorakhpur highlighting the mismanagement and suggestions of improvement. {300 words}
- b) Draft a proposal for the construction of a Creativity Centre for the students of university addressing to the Dean of Students' Affair, MMMUT, Gorakhpur.
- c) Illustrate the structure of a thesis with complete description of the various elements.

Q.4. Attempt any two parts of the following.

(2 x 5 = 10)

- a) Mention the various skills one should exhibit during a professional Presentation.
- b) Discuss the role of a leader in an ongoing Professional Group Discussion.
- c) Illustrate the significance of planning and rehearsal in a professional Presentation and Interview.

Q.5 Attempt any two parts of the following.

(2 x 5 = 10)

- a) What is an Interview? What precautions one must take while participating in a stressed interview.
- b) What is an Extempore? Describe the Do's and Don'ts, a speaker must take in notice during such performances.
- c) Catalogue the list of cautions a professional should have in mind while entering in the communication zone of a multicultural and multinational gathering.

B.Tech.
ODD SEMESTER
 Major Examination 2019-2020
Subject Name: Environment & Ecology

Time: 3 hrs.

Note: Attempt all questions. All questions carry equal marks.

Max. Marks: 50

Q.1 Attempt any five of the following.

- (a) Define the term mining. Classify the different types of mines. 2
- (b) List the benefits related to construction of dam. 2
- (c) What are different sources of freshwater? 2
- (d) What is eutrophication? 2
- (e) Explain energy flow in an ecosystem. 2
- (f) What are the different levels of biodiversity? 2
- (g) Differentiate between endangered and endemic species. 2

Q.2 Attempt any two of the following.

- (a) What are green house gases? Write down the mechanism of green house effects. Write down the impact of green house gases on the environment. 5
- (b) What is water pollution? What are its causes? Write down the steps to control water pollution. 5
- (c) Define the term waste? Explain in detail the different types of wastes. 5

Q. 3 Attempt any two of the following.

- (a) Write short note on:
 - (a) Acid rain
 - (b) Ozone layer depletion.
- (b) What is thermal pollution? What are various causes of thermal pollution? What are its ill effects? 5
- (c) What is soil pollution? Explain how modern methods of agriculture are responsible for soil pollution. 5

Q. 4 Attempt any two of the following.

- (a) What is population explosion? What are its impacts on the modern day society? 5
- (b) Write short note on "Environment Protection Act 1986". 5

(c) What are the issues involved in enforcement of environmental legislation. 5

Q. 5 Attempt any two of the following.

(a) What are NGOs? Write down the role played by NGOs towards the protection of environment. 5

(b) Write short note on "Air (Prevention and Control of Pollution) Act, 1981". 5

(c) What is family welfare programme? List some of the programmes run by the government towards public welfare. 5

Roll No. 2019011036

B.Tech.

(SEM III) ODD SEMESTER

MAJOR EXAMINATION 2019-2020

MECHANICS OF STRUCTURE

Time: 3.0 HRS.

Max. Marks: 50

Note: Attempt all questions. Each question carries equal marks.

1. Attempt any five parts of the following: (5x2=10)

- (a) How is a force transferred to parallel position? Explain with neat sketch.
(b) Draw the shear and moment diagrams for the diving board shown in Fig. 1, which supports the 80-kg man poised to dive. Specify the bending moment with the maximum magnitude.

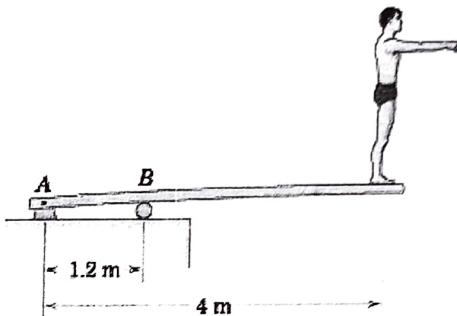


Fig. 1

- (c) Derive the relation between tight side and slack side of a rope.
(d) Determine the centroid of the built up section shown in the Fig. 2. Express the coordinates of centroid with respect to x and y axes. (Note: All dimensions are shown in Fig. 2 are in mm)

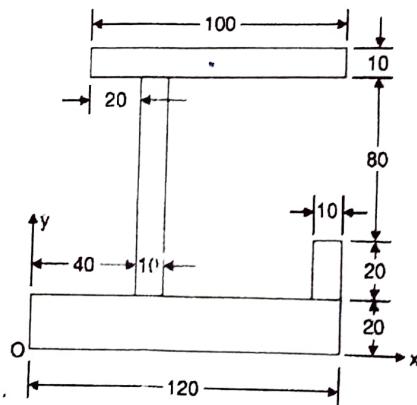


Fig. 2

- (e) State the difference between perfect truss and imperfect truss.

- (f) When do you prefer method of section to method of joints.
- (g) A weight 500 N just starts moving down a rough inclined plane when it is supported by a force 200 N acting parallel to the plane in upward direction and it is at the point of moving up the plane when pulled by a force of 300 N parallel to the plane. Find the inclination of the plane as shown in Fig. 3.

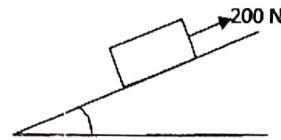


Fig. 3

2. Attempt any **two parts** of the following: (2x5=10)
- (a) Determine the force exerted by the vice on the block when a given force P is applied at C as shown in Fig. 4. Assume that there is no friction.

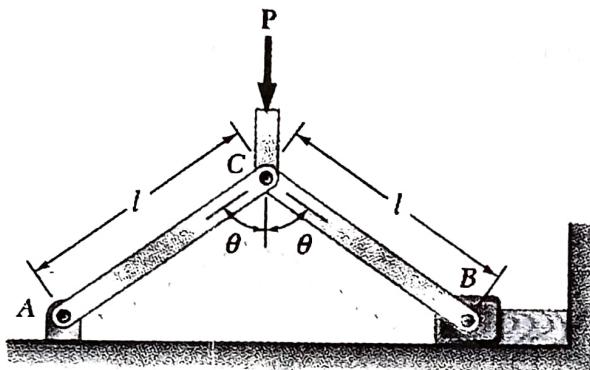


Fig. 4

- (b) Explain principle of virtual work with virtual work done on particle and rigid body in detail.
 (c) List the major advantages of virtual work method and explain mechanical efficiency.
3. Attempt any **two parts** of the following: (2x5=10)

- (a) The velocity of a particle moving in a straight line is given by the expression

$$v = t^3 - t^2 - 2t + 2$$

The particle is found to be at a distance 4 m from station A after 2 seconds. Determine: (i) acceleration and displacement after 4 seconds; and (ii) maximum/minimum acceleration.

- (b) Define active force diagram with neat sketches.
 (c) The motion of cam is defined by the relation $\theta = t^3 - 8t + 15$, where θ is expressed in radians and t in seconds. Determine the angular displacement, angular velocity and angular acceleration after (i) 2 sec. (ii) 4 sec.

4. Attempt any **two parts** of the following: (2x5=10)

- (a) A wheel rotating about a fixed axis at 20 revolutions per minute is uniformly accelerated for 70 seconds during which it makes 50 revolutions. Find
 (i) the angular velocity at the end of this interval and
 (ii) time required for the velocity to reach 100 revolutions per minute
 (b) Explain in brief with suitable examples:

- (i) Translation
- (ii) Rotation
- (iii) General plane motion

5. (c) Ship A is approaching a port in due East direction with a velocity of 15 kmph. When this ship was 50 km from port, ship B sails in N 45° W direction with a velocity of 25 kmph from the port. After what time the two ships are at a minimum distance and how far each one has travelled?

Attempt any **two parts** of the following: $(2 \times 5 = 10)$

(a) State and explain impulse momentum theorem.

(b) Determine the time required for the weights to attain the velocity of 9.81 m/sec. What is the tension in the cord? Take $\mu = 0.2$ for both planes. Assume the pulleys as frictionless as shown in Fig. 5.

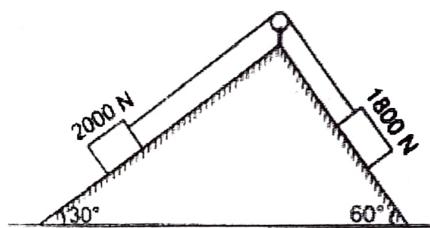


Fig. 5

(c) A man weighing W newton entered a lift which moves with an acceleration of ' a ' m/sec^2 . Find the force exerted by the man on the floor of lift when

- (i) Lift is moving downward
- (ii) Lift is moving upward.

**B. Tech./M.Tech./Msc. (Ist Sem)
ODD SEMESTER
MAJOR EXAMINATION (2019 – 2020)**

Introduction to C Programming

Time: 3 Hrs.

Max. Marks: 50

Note: Attempt all questions. Each question carries equal marks.

1. Attempt any five parts of the following: (5× 2 = 10)

- (a) Differentiate between the break and continue statements by taking a suitable example.
- (b) Differentiate between the register and automatic storage classes in C language by taking suitable examples.
- (c) Write an algorithm to check whether a given number is prime number or not. Also draw the flow chart for it.
- (d) What is an operating system? Discuss in brief about different types of operating systems and their services.
- (e) Discuss in brief about assembly and high-level language.
- (f) Write a C program to test whether a given number is Fibonacci number or not.
- (g) Discuss in brief about Linkers and Loaders.

2. Attempt any two parts of the following: (2× 5 = 10)

- (a) Suppose we are given two arrays A and B which contain a set of integers in ascending order. Write a C program to merge these two arrays and store the result in ascending order in the third array.
- (b) The trace of a square matrix is defined as the sum of its diagonal elements. Write a C program to find the trace of the given $n \times n$ square matrix.
- (c) Write a C program to find the maximum and minimum elements of an array.

3. Attempt any two parts of the following: (2× 5 = 10)

- (a) Write the output of the C program written below , along with proper justification..

```
#include<stdio.h>
int sumdig(int);
int main()
{
    int a, b;
    a = sumdig(123);
    b = sumdig(123);
    printf("%d, %d\n", a, b);
    return 0;
}
int sumdig(int n)
{
    int s, d;
    if (n!=0)
    {
        d = n%10;
        n = n/10;
        s = d + sumdig (n);
    }
    else
        return 0;
    return s;
}
```

- (b) Write a C program to sort a given list of numbers in ascending order by using bubble sort algorithm.
- (c) Write a C program to print the repeated elements of an array and count the number of times they are repeated. If the array contains the elements: 2, 0, 7, 2, 2, 0, 1, 2, 0, 9, 1 then the output should be displayed as follows.

Element	Frequency
2	4
0	3
7	1
1	2
9	1

4. Attempt any two parts of the following: (2× 5 = 10)

- (a) Explain the concept of pointers in C language. Write a C program to swap the two given elements by using the concept of pointers.
- (b) Write the output of the following C program along with proper justification. Given that,
base address of the array: 65535
compiler: 16-bit
- ```
void main()
{
 int *k, *m, **p, ***q;
 int arr[0, 94, 10, 3, 34, 8, 14, 18, 70];
 m = &arr[1]; k = &arr[4]; k = k-2; m = m+3; p = &m; q = &p;
 printf("%d%u", *m, k);
 printf("%d%u", ***q, *(&q));
}
```
- (c) Write a C program that reads several different names and addresses into the computer, rearranges the names into alphabetical order and then writes out the alphabetized list. Make use of structure variables within the program.

5. Attempt any two parts of the following: (2× 5 = 10)

- (a) Write a C program to compare the contents of two files and determine whether they are same or not.

- (b) A C program contains the following declaration.

Static char \*colour [6] = { "red", "green", "blue", "white", "black", "yellow" };

(i) What is the meaning of colour?

(ii) What is the meaning of (colour + 2)

(iii) What is the value of \*colour

(iv) What is the value of \*(colour + 2)

(v) How do colour [5] and \* (colour +5) differ?

- (c) Write in brief about the following-

- I. malloc()
- II. calloc()
- III. realloc()
- IV. Union
- V. File Pointer