U19CS012

Mid Sem Test, October- 2019

First Year B.Tech

PH 102 S1: Mechanics, Lasers and Fiber Optics (MLFO)   Got: 26

Time: 1½ Hour   Total Marks: [30]

Instructions: (1) **All main questions are compulsory.**

(2) **Figures to the right indicate marks.**

(3) **Answers of all main questions must be together with their sub-questions.**

Q-1			Attempt any Two Questions	[10]
	(a)		X-rays of wavelength 10.0×10^{-12} m are scattered from a target. (i) Find the wavelength of x-rays scattered through 45°. (ii) Find the maximum kinetic energy (in eV units) of the recoil (scattered) electrons.	
	(b)		Derive the Planck's law of Black Body Radiation.	
	(c)		What are matter waves? Prove that the group velocity of matter waves is same as that of the velocity of the particle.	
Q-2			Attempt any Two Questions	[10]
	(a)		What are constraints? Classify the constraints with some examples.	
	(b)	(i)	What are the advantages of Lagrangian formalism over Newtonian formalism?	
		(ii)	Write down the Langrange's equation of motion for a particle of mass m falling freely under gravity near the surface of earth.	
	(c)	(i)	Write down Hamilton's principle and derive Langrangian-Euler eqaution.	
		(ii)	Show that the shortest distance between two points in a plane is a straight line.	
Q-3			Attempt any Two Questions	[10]
	(a)		What are Einstein Co-efficients ? Determine relation among them.	
	(b)		Explain the working mechanics of CO_2 Laser.	
	(c)	(i)	What are three level & Four level lasers? Describe briefly their actions. Give reasons for the fact that four level lasers are most efficient than three level lasers?.	
		(ii)	He-Ne lasers operate with 115 volt and 2 amp power supply., emit output power of 100 mW with wavelength 6328 Å. If the beam is focused on the area equal to square of its wavelength calculate (i) intensity of focused beam (ii) efficiency of lasers.	

$$N_{12} B_{12} \varphi \Delta t = N_{21} A_{21} \Delta t$$

$$\varnothing N_{21} B_{21} \varphi \Delta t$$

$$\textcircled{0} = \int_{x_1}^{x_2} L \, dx$$

$$\left[\frac{d}{dt}\left(\frac{\partial L}{\partial \dot{q}}\right) - \frac{\partial L}{\partial q} = 0 \right]$$

$$\sqrt{1 + (y')^2}$$

$$(C) = \frac{1}{2}\int \frac{(y')}{\sqrt{1-(y')^2}}$$

सरदार वल्लभभाई राष्ट्रीय प्रौद्योगिकी संस्थान, सूरत

APPLIED CHEMISTRY DEPARTMENT

MID-SEMESTER EXAMINATION (October 2019)

Got : 23

Date: 04-10-2019
B. Tech.-I

Maximum Marks: 30
Applied Chemistry (CY 104 S1)

Time: 09:00-10:30 am
SEM-I

Instructions: (i) *Write clearly in the margin, the question & sub question nos answered.*
(ii) *Leave 3lines blank for writing next question to use only one answer book.*
(iii) *Write subquestions of a question in a sequence and not at random to avoid errors.*

Q-1) Answer all:
   a) Define Functionality in polymers. (1) No. of bonding sites ...
   b) Explain viscosity average molecular weight in polymers. (1)
   c) Explain the polymer chain architecture illustrating figure. (3)

Q-2) Attempt all:
   a) The Hume Rothery ratio of β-type intermetallic phase of brass alloy is _____ 3:2 . (1)
   b) Write one example (along with its application) of each, polymer matrix composite and ceramic matrix composite. (2)
   c) Give the characteristics and applications of Cartridge brass alloys. (2)

Q-3) Attempt all:
   a) Write the units of hardness. (1)
   b) Discuss the problem of Scales. Write equations. (2)
   c) A sample of water on analysis was found to contain the following impurities:
   $Mg(HCO_3)_2$ = 164 ppm, $Ca(HCO_3)_2$ = 45 ppm, $MgCl_2$ = 95 ppm, $CaCl_2$ = 154 ppm, K_2SO_4 = 15 ppm. Calculate Temporary and total hardness of water in ppm and Cl. (2)

Q-4) Attempt all:
   a) Write WHO definition of Drug. (1)
   b) Draw neat and labeled diagram of dipping calomel electrode and glass electrode. (2)
   c) Give classification of drugs based on its origin. (2)

Q-5) Attempt all:
   a) State Lambert Beer law. (1)
   b) Discuss the conductometric titration curve for weak acid and strong base. (1)
   c) A 2.5 x 10^{-4} M solution of a complex exhibits an absorption maximum at 625 nm with an absorbance of 0.90 when measured in a cuvette with a path length of 1.5 cm. Calculate the absorbance of 1.5 x 10^{-3} M solution of the same complex recorded in a cuvette with a path length of 0.2 cm. (3)

Q-6) Attempt all:
   a) Correlation between pH and corrosion is obtained from _____ Evan Polarization diagram/curve. (1)
   b) Explain Pilling- Bedworth Rule. (2)
   c) Write about Pitting Corrosion. (2)

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S. V. National Institute of Technology, Surat – 395007
Mid Semester Examination, Sept.-Oct. - 2019
B.Tech.- I / M.Sc.-I Sem. – I
APPLIED MATHEMATICS AND HUMANITIES DEPARTMENT
Sub: Mathematics -I (MA 101 S1)

Got = 28/30

Date: 30-09-2019
Time: 1 Hour 30 Minute   Total Marks: [30]
Instructions: (1) All questions are compulsory.
                 (2) Figure to the right indicates marks.

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1. **Answer the following question with justification**   [06]

(I)   If $y = \sin^3 x$;   then $y_n = $ __(a)__ .

(a) $\frac{3}{4}\sin\left(x + \frac{n\pi}{2}\right) - \frac{1}{4}3^n \sin\left(3x + \frac{n\pi}{2}\right)$ (b) $\frac{1}{4}\sin\left(x + \frac{n\pi}{2}\right) - \frac{1}{4}3^n \sin\left(3x + \frac{n\pi}{2}\right)$

(c) $\sin\left(x - \frac{n\pi}{2}\right) - \sin\left(x + \frac{n\pi}{2}\right)$ (d) None of these

(II)   What is the derivative of $\coth x = $ __(a)__ ?

(a) $-\operatorname{cosec} h^2 x$ (b) $\coth x \operatorname{cosec} hx$

(c) $-\operatorname{sec} h^2 x$ (d) None of these

(III)   Expansion of $\tan x = $ __(a)__ .

(a) $x + \frac{x^3}{3} + \frac{2}{15}x^5 + \ldots\ldots$ (b) $x - \frac{x^3}{2} + \frac{x^5}{5} + \ldots\ldots$

(c) $1 - x + \frac{x^2}{2} + \ldots\ldots$ (d) None of these

(IV)   What is the radius of curvature of a circle?

(a) Radius of circle   (b) Circumference of circle

(c) Diameter of circle   (d) None of these

(V)   If $x = r\cos\theta$; $y = r\sin\theta$ then Jacobian $\frac{\partial(x,y)}{\partial(r,\theta)} = $ __(a)__ .

(a) r   (b) $\frac{1}{r}$ (c) 0   (d) None of these

(VI)   If $z = \log\left(x^2 + xy + y^2\right)$, then $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y} = $ __(a)__ .

(a) 2   (b) 1   (c) -1   (d) None these

2. **Answer the following question**

A. Define curvature and derive radius of curvature for the Cartesian co-ordinate sysyem.   [04]

OR

A. State and prove Taylor's series for the function of one variable and deduce it into form of Maclaurin's series

replace a by x

(P.T.O)

B. Answer the following question (Attempt any three) [06]

1. If $y^{1/m} + y^{-1/m} = 2x$; prove that $(x^2 - 1) y_{n+2} + (2n+1) xy_{n+1} + (n^2 - m^2) y_n = 0$.

2. Use Taylor's series to find the expansion of $\log_e x$ in powers of (x-1) and find value of $\log_e (1.1)$.

3. If $u = f(r)$; where $r^2 = x^2 + y^2$ then P.T. $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = f''(r) + \dfrac{1}{r} f'(r)$.

4. Find the least value of the radius of curvature for the curve $y = \log x$; $x > 0$. (-1)

C. If $y = (x-1)^n$, then prove that $y + y_1 + \dfrac{y_2}{2} + \dfrac{y_3}{6} + \dfrac{y_4}{24} + \ldots\ldots + \dfrac{y_n}{n!} = x^n$. [02]

3. **Answer the following question**

A. Define Jacobian and prove that $JJ' = 1$, where J is the Jacobian of u, v with respect to x, y and J' is Jacobian of x, y with respect to u, v. [04]

OR

A. State and prove Euler theorm as well as modified Euler theorem.

B. Answer the following question (Attempt any three) [06]

1. Find the point on the plane $ax + by + cz = p$ at which the function $x^2 + y^2 + z^2$, has minimum value and find this minimum value.

2. In a plane triangle ABC, find the maximum value of $Cos A \ Cos B \ Cos C$.

3. Find the first six terms of the expansion of the function $e^x \log(1 + y)$ in a Taylor's series in the neighbourhood of the point (0,0).

4. If $u = u = f(y - z, z - x, x - y)$; and prove that $\dfrac{\partial u}{\partial x} + \dfrac{\partial u}{\partial y} + \dfrac{\partial u}{\partial z} = 0$.

C. Answer the following question [02]

The diameter and altitude of a can in the shape of a right circular cylinder are measured as 4 cm and 6 cm respectively. The possible error in each measurement is 0.1 cm. Find approximately the maximum possible error in the value computed for the volume and lateral surface.

(P.T.O)

U19CS012

Sardar Vallabhbhai National Institute of Technology
Department of Electrical Engineering
B. Tech-I (Computer), Sem.-I
Electrical Networks

Marks: 30 Sept/Oct-2019 (Mid Semester Exam) **Time: 1.5 hrs**

Q.1 Starting from the basic, derive the relation of average power if a voltage 5
$v(t) = V_m \sin\omega t$ is applied to (i) purely resistive circuit (ii) purely inductive
circuit. Also draw the necessary waveforms in each case.

Q.2 A non-inductive resistor of 12 ohm requires a current of 5 A. However the 5
available low voltage supply is only 100V, 50 Hz. To cut down the voltage to
suit the resistor, a choke coil of effective resistance 2 ohm and inductance L
henry has been connected in the circuit. Calculate (i) the value of L (ii) voltage
across the choke coil (iii) Power factor of the circuit (iv) total power

$P_A = I_A^2 (R_A)$ **OR**

The power dissipated in coil A is 300 W and in coil B is 400 W. Each coil takes
a current of 5 A when connected to 110 V, 50 Hz supply. Find the total current
drawn and power factor when the coils are connected (i) in series (ii) in parallel
across the same supply. $Z_A = \left(\dfrac{V_A}{I_A}\right)$

Q.3 Prove that reactive power in 3-ϕ system with balanced load can be measured by 5
(i) two wattmeter method (ii) one wattmeter method. $V_L \cos(90-\phi)$
$\sqrt{3}(W_1-W_2)$

Q.4 The power input to a three phase balanced, star connected load is measured by 5
two wattmeters both of which indicate 50 kW when the load is connected to a
400 V, 50 Hz supply. If the power factor of the load is now changed to 0.866
leading, determine the readings of the two wattmeters connected to measure
total power. The total input power remains unchanged. Determine the line
current drawn by the load in each case. $\tan\phi = \sqrt{3}$

Q.5 Find out power supplied by 10 V Voltage source using node voltage analysis. **5**
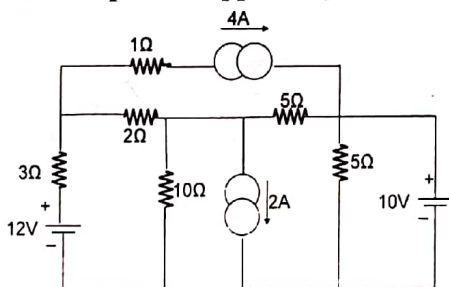
Q.6 Find the current through the $R_L = 5\ \Omega$ connected between terminals A-B in the 5
circuit shown in the figure using Thevenin's theorem.
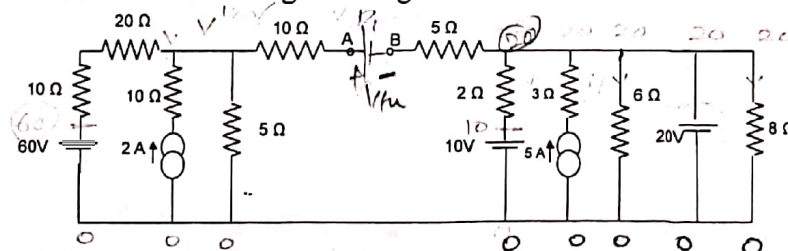
$7V-60 = 60$

$\dfrac{6\times V}{6\times 5} = 2 + \dfrac{V-60}{30} = 0$

B.Tech. I Semester Mid-Semester Examination (Oct 2019)
CEME106 Energy and Environmental Engineering

Got: 22/30

Time : 90 min

Marks : 30

Answer Part A and B separately

PART A (−6)

I   Answer any four   (4 x 1 = 4)

a) Classify the sources of energy with suitable examples.

b) Name two solid fuels, liquid fuels and gaseous fuels with their approximate calorific values.

c) Discuss the difference between SI Engine and CI Engine.

d) What do you mean by priming of pump?

e) State the various components of a thermal power plant.

II   Answer any three   (3 x 2 = 6)

a) Discuss the proximate analysis of coal.

b) For a single cylinder four stroke SI engine operating at 4000 rpm, how many times the spark will trigger in one minute?

c) Which pump is more suitable for an application where very high pressure is required to be developed at moderate discharge.

d) Define COP of a vapor compression refrigeration based system. For a room air conditioner having COP of 3.5, for each MJ of heat removed how much is the input work requirement?

10^{-3} J

$x - y = 10^{-3}$) $(3.5 - 1) = (0.1)$

$1 - (\frac{y}{x}) = (\frac{10^{-3}}{x})$

PART B

**III   Answer any four (4-5 sentences/ 50 words)**   (4 x 2 = 8)

a) Discuss the different processes in the Nitrogen cycle. (−1)

b) Discuss how human activities are affecting the Carbon cycle.

c) What is understood by ecosystem pyramids? Which pyramid is the most useful and why?

d) Why are N and P called nutrients in water quality?

e) Briefly explain a) heavy metals and b) pesticides as water pollutants

IV   Answer any two (7-8 sentences/ 75 words)   (2 x 3 = 6)

a) With examples, explain the role of producers, consumers and decomposers in an ecosystem.

b) Differentiate between with examples i) food chain and food web ii) point and diffused sources of pollution and iii) primary and secondary air pollutants

c) Combustion is the main source of air pollution. Explain how different air pollutants are produced during the combustion of fossil fuels like petrol and coal.

VOC_2 , NO_x , SO_x , CO , CO_2

O_3 ,

125 , (9.5 M) (30)
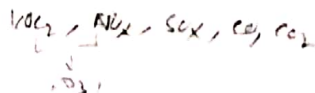
V Answer any three

(3 x 2 = 6)

a) While determining BOD of a wastewater, 10 mL of the sample was added in the BOD bottle of capacity 300 mL. The initial dissolved oxygen (DO) was determined as 7.5 mg/L and the BOD was calculated as 135 mg/L. What would be the final DO? mg/L

b) Air quality standard for Sulphur dioxide (SO_2) (molecular weight 64 g) is 80 µg/m³. Convert this into ppm at 25°C.

c) In a food chain, if the amount of energy at the third trophic level is 5 kJ, what will be the energy available at the producer level?

d) A car has a mileage of 15 km/L of diesel. Determine the amount of carbon dioxide emitted during a drive of 100 km. Assume diesel can be represented as $C_{12}H_{24}$ and the specific gravity of diesel is 0.9. (Hint: Use stoichiometry)

Got (18/30!)

Mid-semester

INSTRUCTIONS:-
(1) Figure to the right indicates full marks.
(2) Assume suitable data if required.

SECTION-I

Q-I	DRAW THE FOLLOWING.	
a	Draw sectional elevation along section X-X and plan for the object given in Fig. I using first angle projection method.	11
	OR	
a	Draw sectional elevation along section X-X and plan for the object given in Fig. I using first angle projection method.	11
b	Fig. II shows orthographic projections of the object. Draw isometric drawing for the same.	04

Fig-I

ELEVATION

PLAN

Fig-II
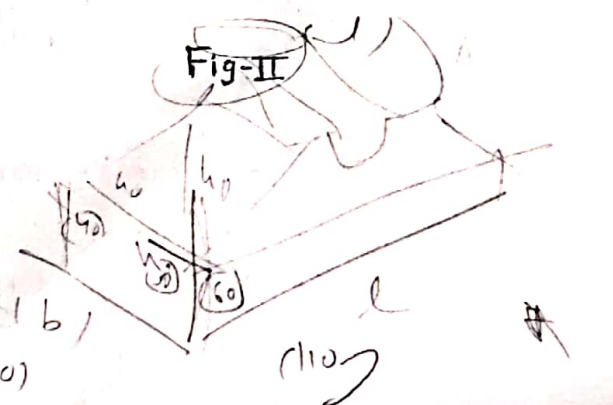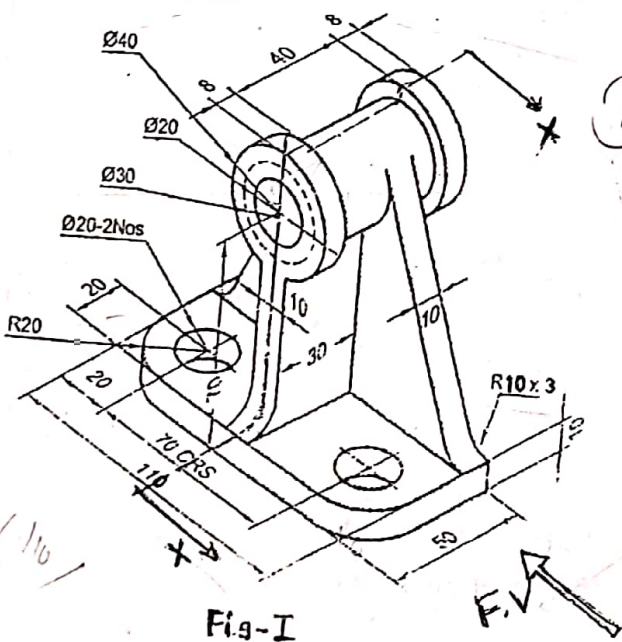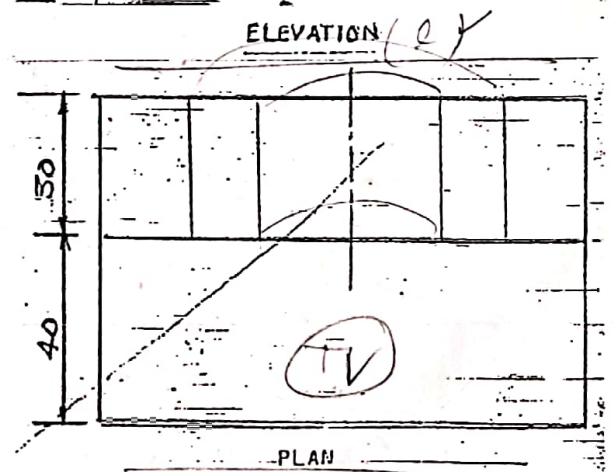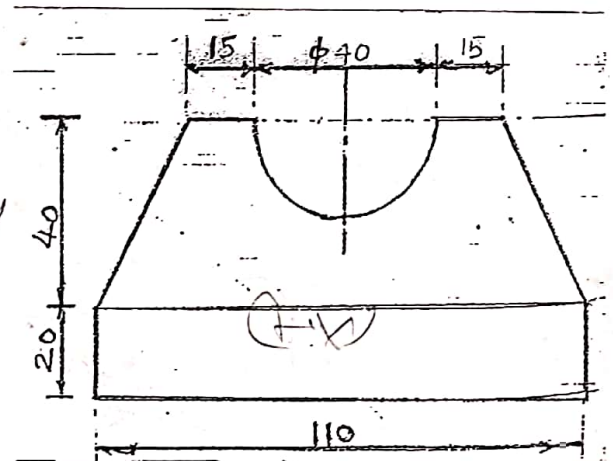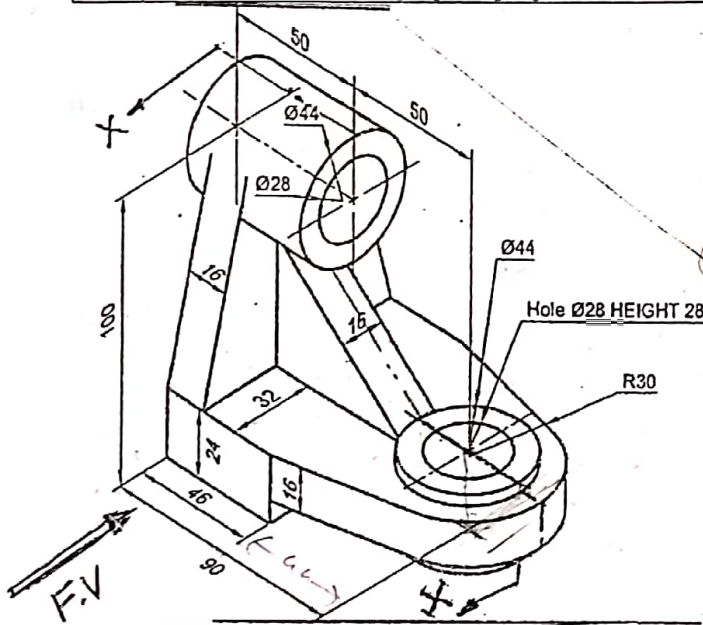
SECTION - II

Q.1 (a) Attempt **ANY TWO** of the following : (3)

(1) Draw the projections of the following points. Also mention the quadrant.

(a) Point M is 10 mm in front of VP and 20 mm above HP

(b) Point N is in the VP and 25 mm below HP

(2) A line AB 35 mm long is parallel to HP and perpendicular to VP. Point A is 20m below HP and 10 mm behind VP. Draw the projections of the line AB. Also show HT and VT.

(3) A line AB is parallel to VP and inclined to 40^0 to HP. Its top view is 50 mm. The end A is 10 mm above HP and 15 mm in front of VP. Draw the projections of the line. Determine the true length of the line. Mark HT and VT also.

(4) A line PQ 45 mm is parallel to HP and inclined to VP. Its front view is 35 mm long. Draw the projections of the line and determine the true inclination of the line with VP.

Q.2 Attempt **ANY TWO** of the following : (8)

(1) Line AB 45 mm long is inclined to VP by 45^0 and to HP by 30^0. Point A is 10 mm behind VP and 20 mm below HP. Point B is in first quadrant. Draw the projection of the line AB. Also show HT and VT.

(2) Line PQ is inclined to HP by 45^0. Front view and top view of line is 43 mm and 36 mm long respectively. Point A is 15 mm away from both the planes. Point A is in first quadrant. Draw the projection of the line PQ and determine the true length of the line and true inclination of line with VP.

(3) Front view of the line AB is 45 mm long. Top view is inclined to xy by 30^0. Distance between the end projectors is 30 mm. Draw the projection of the line and determine the true length of the line and true inclinations of the line with HP and VP. Also show HT and VT. Solve by any methods.

Q.3 Two fixed points A and B are 100 m apart. Trace the complete path of a point P moving in the same plane as that of A and B in such a way that, the sum of its distances from A and B is always the same and equal to 130 mm. Name the curve. Draw the tangent and normal from the point which is 20 mm above the line joining the points A and B. Solve by oblong method. (4)