सरदार वल्लभभाई राष्ट्रीय प्रौद्योगिकी संस्थान, सूरत

Examination: End semester Month/Year: Dec, 2019 Program: B.Tech. /M.Sc.

Course: Mechanics, Lasers and Fibre Optics

Duration: 03 hrs **Total marks: [50]**

Instructions:
- Please maintain order of questions
- Assume suitable data and specify them in the answers
- Q. 1 and Q. 2 are compulsory. Q. 3. has an optional Q. 3.

Q. 1. Attempt any Four **(05 x 04 = 20)**

(A) What is a wave function of a particle? Describe and explain the conditions of permissible wave functions.

(B) Explain the photo electric effect experiment in detail using suitable diagram. Explain how the quantum hypothesis explained the results satisfactorily. Use suitable equations in your explanation.

(C) Define the following: 1. Eigen functions of an operator
2. Expectation value of position of a quantum ensemble.

(D) Which of the following can't be solutions of Schrodinger's equation for all values of x? Give proper reasons for your arguments. (i)$\Psi = A \sec x$, (ii) $\Psi = A \tan x$, (iii) $\Psi = A e^{x^2}$ (iv) $\Psi = A e^{-x^2}$. (e raise to x squared)

(E) Ultraviolet light of wavelength 350 nm and intensity 1.00 W/m^2 is directed at a potassium surface (Work- function = 2.2 eV). (a) find the maximum KE 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 ?

Q. 2. Attempt any Four **(05 x 04 = 20)**

(A) What are modes of propagation in optical fibre and how they propagate in them.

(B) Give the advantage of optical fibre over present transmission lines. Show that figure of merit of fibre depends only on refractive index of core and clad, and is independent of fibre dimension.

(C) The factors causing loses in optical fibres. And provide the wave lengths used in optical fibres for propagation.

(D) Explain mechanism of He-Ne laser?

(E) (i) A fibre has cut-off V number equal to 2.42. It is made with a core diameter of 8 μm and propagating in it is of 1.3 μm. its core glass has a refractive index of 1.54.
(a)Find the maximum value required for the normalized index difference.
(b) Find the refractive index for the cladding glass.
(c) Find the fibre acceptance angle.

(ii) A laser beam has a power of 50mW. It has an aperture of 5 X 10^{-3} and it emits light of wavelength 7200 Å. The beam is focused with a lens of focal length 0.1 m. Calculate the area and intensity of the spot.

Q. 3. Attempt all **(05 x 02 = 10)**

(A) Write Maxwell equations specifying the divergence and curl of electric and magnetic fields. Give physical significance of each equation.

(B) Derive differential and integral form of Maxwell equations. How Maxwell fixed Ampere's law by applying the continuity equation.

OR

Q. 3. Attempt All **(05 x 02 = 10)**

(A) State and derive Kepler's third law.

(B) Derive the equation of motion for the simple pendulum problem using Hamiltonian-method.

सरदार वल्लभभाई राष्ट्रीय प्रौद्योगिकी संस्थान, सूरत

U19CS012 / D12

APPLIED CHEMISTRY DEPARTMENT

END SEMESTER EXAMINATION

Got: 41

Date: 04-12-2019 | **Maximum Marks: 50** | **Time: 08:30am -11:30 am**

B. Tech.-I | **Applied Chemistry (CY 104 S1)** | **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) DP in polymers stands for Degree of Pol... . (1)
b) Draw the kind of arrangement (orientation) observed in gutta percha. (2)
c) Discuss the role of camphor as moulding ingredient of a plastic. (2)
d) Explain the molecular-mass distribution curve in polymers. (2)
e) Describe injection moulding. (3)

Q-2) Answer all

a) Write any Two Boiler problems. (1)
b) With a neat diagram explain Ion exchange process for softening hard water. (2)
c) Discuss the problem of Caustic embrittlement. (2)
d) Calculate the amount of lime required for softening 40,000 liters of hard water containing $Mg(HCO_3)_2$ = 14 ppm, $Ca(HCO_3)_2$ = 50 ppm, $MgCl_2$= 85 ppm, $CaCl_2$ = 125 ppm and K_2SO_4 = 30 ppm. (3)

Q-3) Answer all

a) Amongst various examples of corrosion, crevice corrosion is NOT an example of dry corrosion. (True or False). {Give justification, if false} (1)
b) What is Sacrificial Anodic Protection? Mention its two uses? (2)
c) Define Corrosion Inhibitor and Write short note on vapour phase inhibitor. (2)
d) Write the definition and an application (for each) of different types of organic coatings? (3)

Q-4) Answer all

a) Give only names of four different types of injection routes of drug administration. (1)
b) Write in detail about precipitation potentiometric titration with diagrams and graphs. (2)
c) Draw and explain structure of penicillin. Write about its stability, solubility and activity. (2)
d) Give classification of drugs based on its therapeutical action with definition and examples. Write atleast 6 types. (3)

Q-5) Answer all

a) Write relationship between absorbance and %Transmittance. (1)
b) What are the requirements of a true dye? (2)
c) Discuss the titration curve obtained in the titration of a strong acid with a weak base. (2)
d) An aqueous solution of hemoglobin has a molar absorptivity value of 18,600 L $mol^{-1}cm^{-1}$ for an absorbance value of 0.1 at 540 nm (Given: cell thickness = 1 cm). Calculate the hemoglobin concentration (in μM). (3)

Q-6) Answer all

a) Which type of brass alloy possess corrosion resistance towards salty water and used to prepare table ware, ornaments and, for coinage applications? (1)
b) Discuss briefly the materials that are used for fiber reinforced composites. (2)
c) Calculate the % atom economy of following reaction (to prepare n-propane),

$$CH_3\text{-}CH{=}CH_2 + H_2 \xrightarrow{\text{Ni Catalyst}} CH_3\text{-}CH_2\text{-}CH_3$$

(Given: At. wt. of C = 12.011, and H = 1.008) (2)
d) Draw a schematic diagram of Sol-gel process. (3)

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(D-12)
[U19CS012]

S. V. National Institute of Technology, Surat

End semester Examination December 2019

B.Tech. I (First Semester)

Sub: Mathematics I (MA 101 S1)

Expected (41.5+)
Got: 44

Date: 02 -12-2019 **Instruction: (i) Attempt all questions.** **Time: 3 Hour**
(ii) Figures to the right indicate marks. **Marks: 50**

43 +1

1 **Answer the following question with justification:** **[10]**

(i) If $y=\dfrac{(3x+1)}{(x+1)^2(x-2)}$ then $y_n =$ _____.

(a) $\dfrac{(-1)^n}{3}\left[-\dfrac{5n!}{3(x+1)^{n+1}}+\dfrac{7n!}{3(x-2)^{n+1}}+\dfrac{2(n+1)!}{(x+1)^{n+2}}\right]$ (b) $\left[\dfrac{6n!}{(x+1)^{n+3}}+\dfrac{n!}{3(x-2)^n}\right]$

(c) $\left[\dfrac{1}{(2x+1)^{n+1}}+\dfrac{1}{(x+1)^{n+1}}\right]$ (d) None of these

(ii) What is expansion of $\dfrac{e^x}{\cos x}$?

(a) $1+x+\dfrac{x^2}{2!}+\ldots..$ (b) $1+x+\dfrac{2x^2}{2!}+\dfrac{4}{3}x^3+\ldots$ (c) $x+\dfrac{x^3}{3!}+\ldots.$ (d) None of these

(iii) If $u=\sin^{-1}\left(\dfrac{\sqrt{x}-\sqrt{y}}{\sqrt{x}+\sqrt{y}}\right)$ then $xu_x+yu_y =$ _____.

(a) 0 (b) 1 (c) -1 (d) None of these

(iv) If $x=r\cos\theta,\ y=r\sin\theta$ then $\dfrac{\partial(x,y)}{\partial(r,\theta)}=$ _____.

(a) r (b) 1/r (c) zero (d) None of these

(v) What is the formula of radius of curvature for equation y = f(x) curve?

(a) $\dfrac{\left(1+y_1^2\right)^{3/2}}{y_2}$ (b) $\dfrac{\left(x^2+y^2\right)^{1/2}}{x'y''-y'x''}$ (c) $\dfrac{\left(1+y^2\right)^{1/2}}{y}$ (d) None of these

(vi) What will be the equation of tangent plane to the surface $x^3+y^3+z^3=3xyz$ at (1,2,3)?

(a) 4x-2y-z+26=0 (b) $5x-5y-7z+26=0$ (c) 5x+4y+z=25 (d) None of these

(vii) What will be tangent at the origin for the curve $y^2=4ax$?

(a) y- axix (b) x- axis (c) zero (d) None of these

(viii) A necessary condition for the existence of a maximum or minimum is _____.

(a) $f_x=0,\ f_y=0$ (b) $f_{y_x}=0\ f_{yy}=0$ (c) $f=0$ (d) None of these

(ix) $\lfloor n+1 =$ _____. (a) $n\lfloor n$ (b) (n-1)! (c) $\lfloor n$ (d) None of these

(x) What will be area lying between the parabola $y=4x-x^2$ *and the line* $y=x$?

(a) 4.5 (b) 3 (c) 2.5 (d) None of these

2 **(A)** If $y=(ax+b)^m$, then derived general formula of y_n for m < n, m > n and m = n. **OR** **[02]**

(A) Define curvature and derive radius of curvature for Cartesian co-ordinate form.

(B) Attempt any Three of the following: **[06]**

(i) Prove that if $y=\sin nx+\cos nx$, then $y_r=n^r\left[1+(-1)^r\sin 2nx\right]^{1/2}$.

1 (i) 2 (c) 3 (a)

(ii) Expand $\log\left[x+\sqrt{1+x^2}\right]$ in Maclaurin's series.

(iii) *Exapand function* $f(x)=x^5-x^4+x^3-x^2+x-1$, *in powers of* $(x-1)$.

(iv) Trace the curve with justification $y(x^2+a^2)=a^3$.

(C) A railway track has the form of a curve $y=x^3$, where x and y are expressed in km. At what rate will the engine be changing direction with respect to the distance when passing through the point (2,6)? **[02]**

3 (A) State and Prove Euler's theorem and Modified Euler's theorem. **OR** **[02]**

(A) Discuss Lagrange's of undetermined multipliers method to extremum value for function of two variable.. **[02]**

(B) Attempt any three of the following: **[06]**

(i) If $u=\sin^{-1}\dfrac{x+y}{\sqrt{x}+\sqrt{y}}$ P.T. $x^2u_{xx}+2xyu_{xy}+y^2u_{yy}=-\dfrac{\sin u\cos 2u}{4\cos^3 u}$

(ii) Find the value $(27.1)^{\frac{2}{3}}+\sqrt{26}$ using the method of error and approximation

(iii) State Taylor's series for two variables and expand $x^2y+3y-2$ in powers of (x-1) and (y+2).

(iv) A rectangular box, open at the top, is to have given capacity. Find the dimensions of the box requiring least material for its construction.

(C) Prove that the value of **[02]**

$f=\dfrac{x^2}{a^2}+\dfrac{y^2}{b^2}+\dfrac{z^2}{c^2}$ *where* $lx+my+nz=0$ *&* $\dfrac{x^2}{a^2}+\dfrac{y^2}{b^2}+\dfrac{z^2}{c^2}=1$ *are roots of the equation* $\dfrac{l^2a^4}{1-a^2f}+\dfrac{m^2b^4}{1-b^2f}+\dfrac{n^2c^4}{1-c^2f}=0.$

4 (A) Trace the curve $r=a(1+\cos\theta)$. **OR** Trace the curve $x=a(t+\sin t), y=a(1+\cos t)$. **[02]**

(B) Solve any Three: **[06]**

(i) Evaluate : $\int_0^\infty \frac{x^c}{c^x}dx$ $(c>1)$. (ii) Evaluate : $\int_0^1 \frac{dx}{\sqrt{1-x^4}}$.

(iii) Evaluate $\int_0^{\pi/2}\sqrt{\tan\theta}\,d\theta$. (iv) Show that $\mathbf{B}(p,q)=\int_0^\infty \frac{y^{q-1}}{(1+y)^{p+q}}dy=\int_0^1 \frac{x^{p-1}+x^{q-1}}{(1+x)^{p+q}}dx.$

(C) Trace the cureve the asteroid $x^{2/3}+y^{2/3}=a^{2/3}$. **[02]**

5 (A) Find the volume of the paraboloid of revolution $x^2+y^2=4z$ cut off by the z =4. **OR** **[02]**

(A) Evaualte $\iint_R (x+y)^2\,dxdy$ where R is the parallelogram in the xy-plane with vertices (1,0), (3,1), (2,2), (0,1) using the transformations u = x + y and v = x - 2y.

(B) Attempt any Three of the following: **[06]**

(i) Evaluate $\iint r\sin\theta\,dr\,d\theta$ over the area of the cardioid $r=a(1+\cos\theta)$ above the initial line.

(ii) Evaluate $\iiint(x^2+y^2+z^2)^m\,dxdydz$ $(m>0)$ through the volume of the sphere b $x^2+y^2+z^2=1$, by changing into spherical polar co-ordinates.

(iii) Find the volume bounded by the cylinder $x^2+y^2=4$ and the planes y + z =4 and z =0.

(iv) Trace the curve $y^2(2a-x)=x^3$.

(C) Find the volume of a sphere of radius *a*, by triple integration. **[02]**

① Highlight Answer
②

(D-12)

Roll No = U19CS012

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

Got : 63

Marks: 100 **December-2019 (End Semester Exam)** **Time: 3 hrs**

1 In Fig.1 , the capacitor C has a capacitance of 25.5 μF. The current flowing through the circuit is 0.4 A. If the voltages across different elements of the circuit are as indicated in the diagram, find the following for the circuit: (i) Frequency of supply voltage (ii) parameters of iron cored choke coil (iii) supply Voltage (iv) power loss in coil and total power loss (v) value of apparent and reactive power. (8)

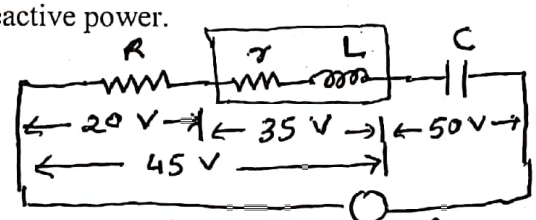


Fig.1

OR

In the circuit shown in Fig.2, determine (i) total impedance (ii) total current (iii) current in each branch (iv) overall pf (v) active, reactive and apparent power.

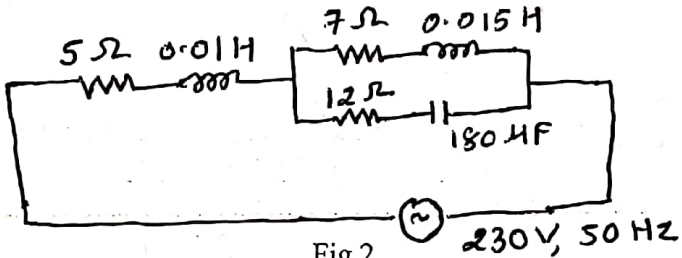
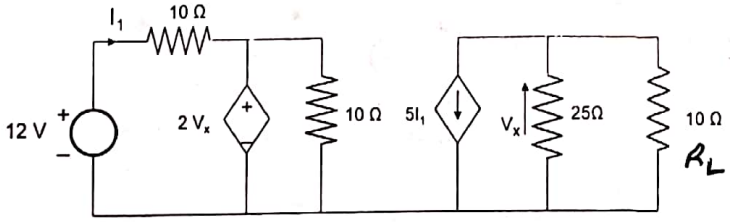


Fig.2

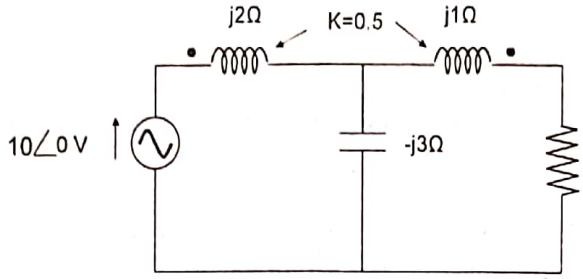
2(a) Discuss the variation in wattmeter readings due to different value of phase difference between phase voltage and phase current if two wattmeter method is used to measure total power in a three phase system 5

(b) Three similar coils are connected in star to a three phase, 415 V, 50 Hz supply. The line current is 4 A at a power factor of 0.6 lagging. (i) Calculate the resistance and inductance of coil (ii) If the coils are now connected in Delta across the same supply, find the line current and readings of the two wattmeters connected to measure the total power. 5

3 Find out current passing through R_L using Thevenin's theorem **OR** Norton's theorem. 10



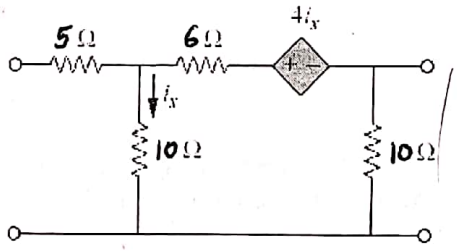
Find out current passing through 5 ohm resistance. **15**



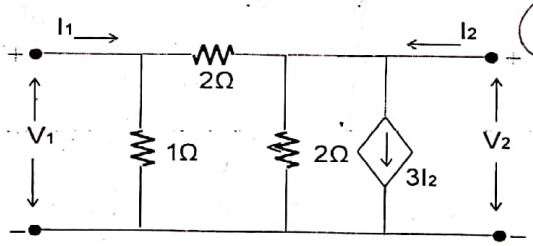
5 (a) Explain the Short Circuit test carried out on a transformer with its importance. **6**

(b) Calculate the efficiency at full load, half load and one-fourth load at (i) unity power factor (ii) 0.8 pf lagging for 100 kVA, 1100/250 V, 50 Hz single phase transformer. Its full load copper loss and Iron loss are 1200 W and 960 W respectively. **6**

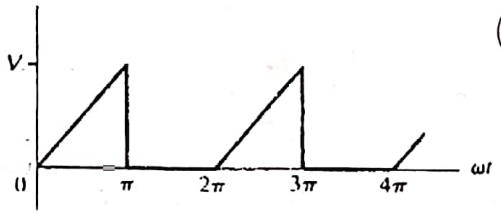
6 Obtain h-parameters for the two port network shown in figure. **10**



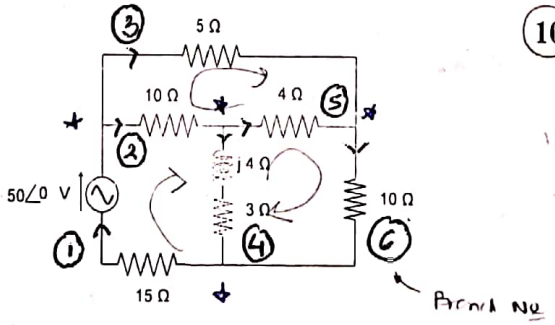
7 Find the z-parameters for the two port network shown in figure **10**



8 Find the trigonometric form of Fourier series for the waveform as shown in figure. **15**



9 For the circuit shown in Fig draw the graph and prepare complete incidence matrix. Also, Find out the possible number of tree. **10**



B.Tech. I Semester End-Semester Examination (Dec 2019)
CEME106 Energy and Environmental Engineering

Time : 3 h

Marks : 50

Answer Part A and B separately

PART A

I Answer **any four** (4 x 2 = 8)

a) Compare solid, liquid and gaseous fuels.
b) What is Solar Constant? List out various Solar Systems converting solar energy to useful Heat or Electrical Energy.
c) Give the various components of *any one* (i) thermal power plant OR (ii) Internal Combustion Engine
d) What do you mean by one Tonne of Refrigeration? Define COP of a refrigeration system.
e) Give two differences between horizontal axis wind turbine and vertical axis wind turbine. Which is more popular? Name the major components of Horizontal Axis Wind Turbine
f) State any four different types of batteries. Give general specifications of any one battery.

II Answer **any three** (3 x 3 = 9)

a) Define Calorific Value of fuel. How does Gross Calorific Value differ over Net Calorific Value?
b) What is the general composition of Biogas? Compare Fixed Dome Biogas Plant over Floating Dome (only two points).
c) A three blade wind rotor with blade length of 55 m is operating in a wind stream having wind velocity of 10 m/s. Air density is 1.12 kg/m^3 and power coefficient may be taken as 0.4. Calculate the extractable power from the wind.
d) With a sketch discuss the composition of 'Star and Labeling' of any domestic appliance.
e) Why Electric Vehicles are emerging in the Indian Context? How Electric Vehicles are different over Hybrid Electric Vehicles?

PART B

III. Answer **any six** (*around 80 words*) (6 x 2 = 12)

a) Briefly explain the different processes in the Carbon Cycle.
b) What are the important soil pollutants? Discuss their effects.
c) Explain the chemistry of ozone layer depletion in the stratosphere.

d) What is the purpose of disinfection in water treatment? Name a few commonly used disinfectants.

e) Explain the global effects of climate change.

f) What do you understand by (i) global warming potential (ii) carbon credits (iii) ozone depletion potential?

g) Briefly discuss the LCA procedure and its usefulness.

h) Briefly discuss the different international agreements/treaties for controlling global warming and ozone layer depletion.

IV Answer any four *(around 100-120 words)* **(4 x 3 = 12)**

a) With a sketch explain the processes used in a typical municipal wastewater treatment plant.

b) Discuss the different processes for treatment/disposal of municipal solid wastes? Briefly explain any one method.

c) Explain the steps/procedure in conducting an Environmental Impact Assessment (EIA).

d) What do you understand by PM10 in air pollution? Explain the methods to control particulate air pollutants.

e) What are the measures to be taken for containing noise pollution?

V Answer all questions **(3 x 3 = 9)**

a) A water treatment plant used 5400 **kg** of alum in the month of November 2019. If the alum dose was 12 **mg/L**, determine the capacity of the treatment plant in million litre per day (MLD).

b) The moisture contents of the different waste components in a municipal solid waste are given below. Calculate the overall moisture content of the waste.

Component	Moisture content (%)	Percent by weight
Food	70	25
Paper	6	23
Plastics	2	10
Textiles	10	7
Rubber	2	3
Metals	3	10
Yard waste	60	22

c) What sound power level in decibels would result from combining the effects of three levels 70 dB, 80 dB and 75 dB?

SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY

Engineering Graphics & Engineering Drawing Examination

B Tech-I Sem-I END SEM EXAM -DEC-2019

Time: 3 hours

Total Marks:100

Instructions:

1. Write the answer of each section in separate answer book.
2. Figure to the right indicates full mark.

SECTION-I

Q-I	Draw the sectional elevation along section XX and top view an of object shown in Fig. I using first angle projection method.	(20)
Q-II	Draw the isometric view of the projection shown in Fig. II.	(15)
Q-III	A square prism, edge of base 45 mm and height 85 mm, resting on its base in HP, with a vertical face inclined at 60° to VP, is completely penetrated by another square prism, edge of base 35 mm and 90 mm long, having one of its rectangular faces inclined at 30° to VP. The axis of two prisms are parallel to the VP and bisect each other at right angles. Draw the projections of the solids showing lines of intersection and develop cut prism.	(15)
	OR	
Q-III	A cone, base diameter 80 mm and height 85 mm, resting on its base on HP is completely penetrated by a cylinder of diameter 40 mm such that its axis is parallel to both the HP and VP and is 23 mm above the base of the cone and 6 mm in front of the axis of the cone. Draw projections of solids showing curves of intersection. Assume any suitable length of the cylinder. Also draw development of cut cone.	(15)

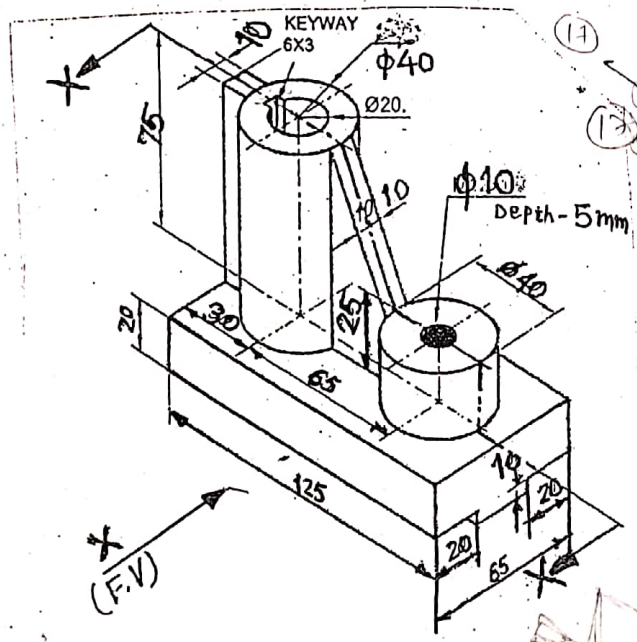


Fig-I

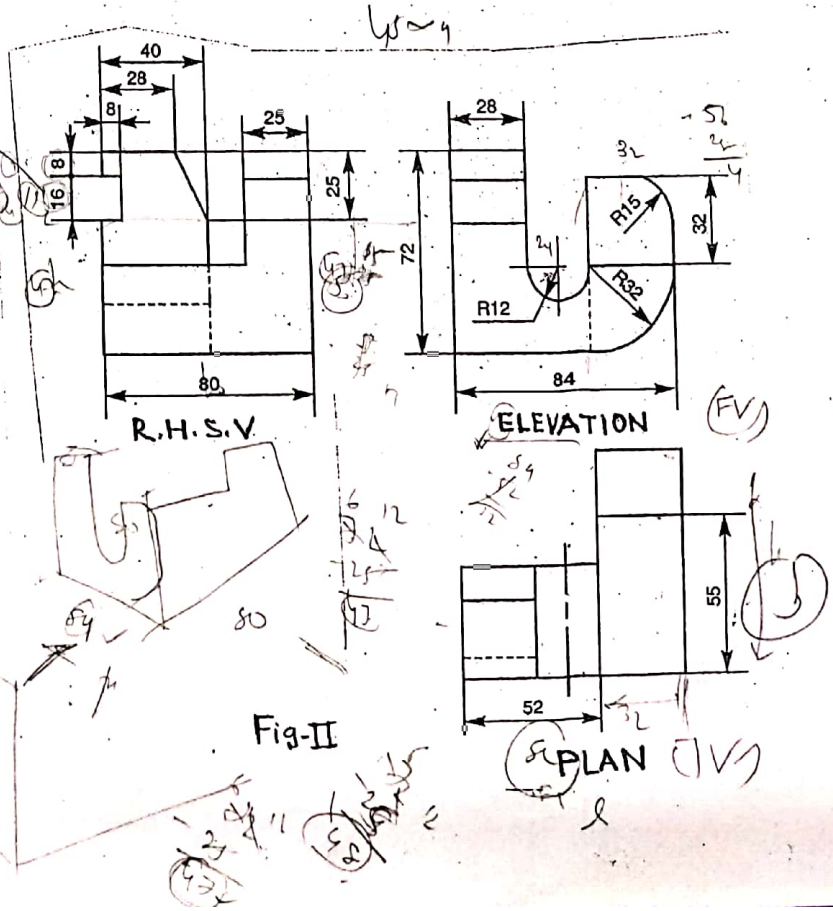


Fig-II

SECTION - A

Q.1 Three vertical poles AB, CD and EF are respectively 6m, 9 m and 12 m long. Their bottom ends B, D and F are on the ground and lie at the corners of an equilateral triangle of 10 metres long sides. Determine graphically the distance between the top ends of the poles i.e. AC, CE and EA. Assume the thickness of the pole as a line. Take the scale as 1/200. **8**

OR

Two mangoes on the tree are 2.3 m and 3.5 m above the ground. They are on the either side of the compound wall and away by 1.5 m and 2.1 m from the wall. The distance measured along the wall between two mangoes is 2.8 m. Determine the shortest distance between the mangoes. Take the scale as 1/100. **8**

Q.2(a) A wheel of 50 mm diameter rolls outside the on another circle of 150 mm diameter. Draw and name the curve traced out by the point on the circumference of the wheel for one revolution of the wheel. **8**

Q.2(b) A string is unwound from a square of 25 mm side. Draw the locus of of end P of string for the string's one turn. String is kept tight during unwounding operation. Draw tangent and normal to the curve at any point. **6**

Q.2(c) Construct an archemedian spiral of one convolution. Maximum and minimum radius are 50 mm and 26 mm respectively. **9**

OR

Construct logarithmic spiral for one convolution. The length of the shortest radius is 15 mm and the ratio of the lengths of the successive radius vector is equal to 5/4. Vectorial angle is 30^0. **9**

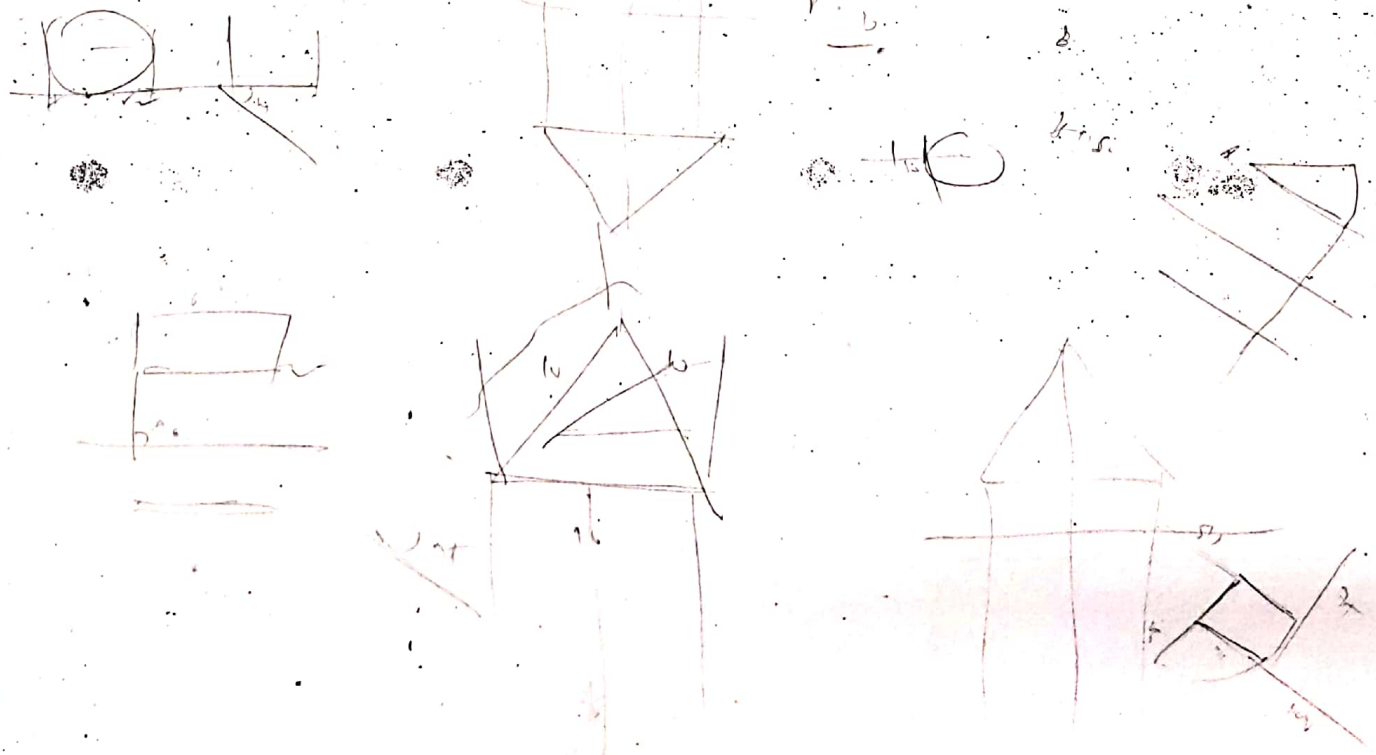
Q.3(a) A cicular plate 60 mm in diameter is resting on VP on one of the points of its periphery with the surface of the plate perpendicular to HP and inclined to VP by 45^0. **6**

Q.3(b) ABCD is a rhombus of diagonals AC = 110 mm and BD = 70 mm. Its corner A is in the HP and the plane is inclined to HP by 50^0. The plan of diagonal AC makes an angle of 25^0 to the VP. Draw the projections of the plane. **9**

OR

Q.3(b) Draw the projections of the rectangle 60x40 mm with one of its longer side parallel to the VP. Rectangular plane is inclined to VP by 45^0. Shorter side of the plane is inclined to HP by 30^0. **9**

Q.3(c) A cylinder with 40 mm as diameter of the base and height as 50 mm is resting on HP on its base with axis of the cylinder 10 mm away from VP. **4**



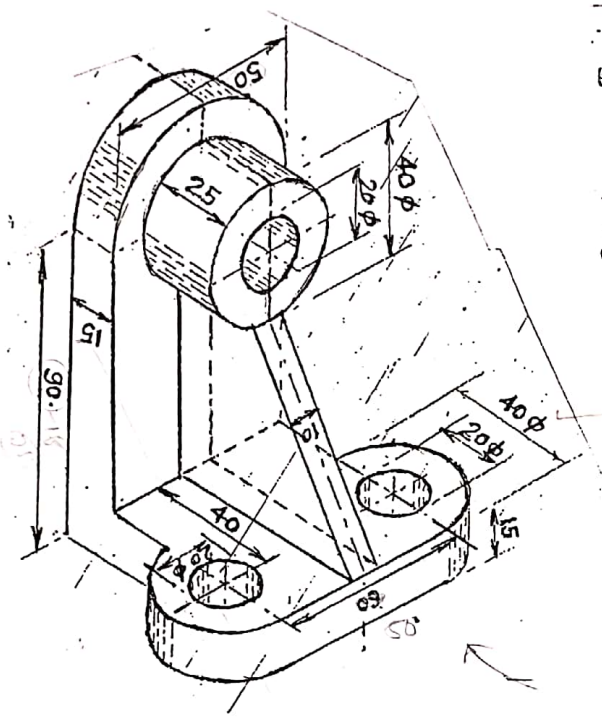
2:15 - 3:15
(2:45)

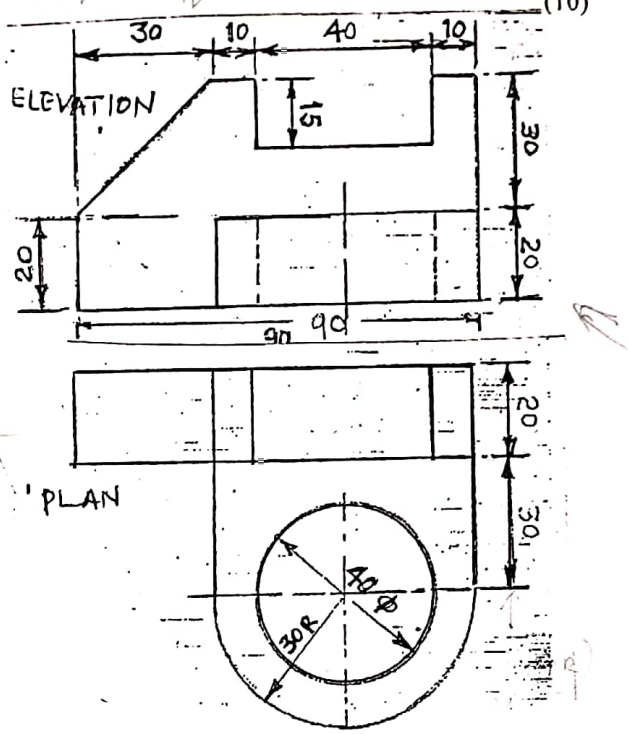
QUIZ TEST
SEPTEMBER-2017

Time: 1 hours
Total Marks: 20

EX-I Draw plan and elevation for fig-I using first angle projection method. (10)

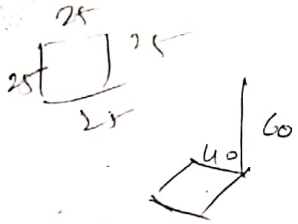
EX-II Draw the Isometric view of the object whose elevation and plan are shown in Fig.-II. (10)



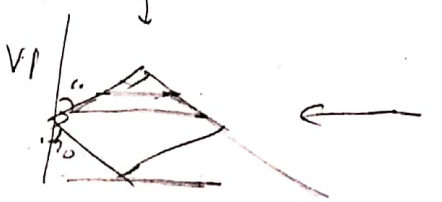


E.D. (Mechanical) Practical Test **(20 Marks)**

Division D (25/11/2019) **Time: 1 hour**



1. A square prism, side of base 40mm and height 60 mm, is resting on H.P. on its base with one of the sides/edges of the base inclined 30° to V.P. It has a horizontal square hole of 25 mm side and 50 mm length with its axis parallel to V.P. and 10 mm nearer to the observer. Flat faces of the hole are equally inclined to H.P. and V.P. Draw projections and show the lines of intersection. **(12 Marks)**



2. Draw elevation in X direction **(8 Marks)**