

MIDWESTERN UNIVERSITY
FACULTY OF ENGINEERING
Examination Control Division

2073 Chaitra

Exam	Regular/Back		
Level	BE	Full Marks	50
Program	Computer	Pass Marks	25
Year/Part	I/I	Time	3 Hrs.

Subject: Basic Electrical Engineering (EL501)

- Attempt all questions
- Candidates are required to answer the questions in their own words as far as possible.
- Assume suitable values, with stipulation, if necessary.
- Figures in margin indicate full marks.

- 1 a. State Ohm's law and define 1 Ohm. [1]
 - b. A coil consisting of 3000 turns of copper wire has the cross-sectional area of 0.4mm^2 . The mean length per turn is 18 cm and resistivity of copper is $1.5 \times 10^{-8} \Omega \text{ m}$ at normal temperature. Calculate the resistance of the coil and power dissipated when the coil is connected across 50V dc supply. [3]
- 2 a. In which types of circuits the current and the voltage are divided? [1]
 - b Find the current through 3Ω resistor using loop analysis in the circuit given below: [4]
- 3 Find the nodal voltages of the given network by using nodal analysis method [3]
- 4 a. State maximum power transfer theorem. [1]
 - b. Use Superposition Theorem to determine the current in the branch 2Ω of the network given below: [4]
- 5 For the circuit shown below, calculate the current in the 6Ω resistor using thevenin's theorem [3]
- 6 What is capacitance? Explain briefly how charge is stored in capacitor. Also find the equivalent capacitance of three capacitors when connected in series. [4]
- 7 a. Prove that for full wave rectified voltage wave $V_{av} = V_m$ [3]
 - b. An alternating current of frequency 60Hz has a maximum value of 12A. Calculate instantaneous value of the current when $\omega t = \dots$ [2]
- 8 a. Explain in detail, the ac through RLC circuit. [3]
 - b. Write down the condition of resonance in RLC series circuit. [2]
- 9 If 5Ω resistor, $50\mu\text{F}$ capacitor and 20mH of inductor are connected in series with 230V, 50Hz power supply. Calculate: [3]
 - i) Impedance
 - ii) Current
 - iii) Active Power
 - iv) Apparent power
 - v) voltage across inductor with phase
- 10 Derive the relation between line voltage and phase voltage in Star connection in three phase ac. Also find power. [4]

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Subject: Basic Electrical Engineering (EL501)

- Attempt all questions
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- Define temperature coefficient of the resistance with necessary expression.
 - What is resistivity? Show the relation of resistivity with resistance.
- Define node, path, branch and mesh of the circuit
 - Calculate the total resistance of the network between points A and B of the circuit shown below
- Find the mesh current in the given network below using mesh analysis
- State Norton's theorem.
 - Use superposition Theorem to find current through 3Ω resistor in the circuit given below:

Determine the current through 3Ω resistor in the circuit given below using Thevenin's Theorem:

5

- 6 What is capacitance? Explain briefly how charge is stored in capacitor. Also find the equivalent capacitance of three capacitors when connected in Parallel. [3]
- 7 a. Prove that $I_{Rms} = 0.707I_m$ [3]
 b. An alternating current of frequency 60Hz has a maximum value of 12A. Find the value of current after 1/360 seconds. [2]
- 8 Explain in detail, the ac through purely inductive circuit and show the equation of power. [5]
- 9 A resistance of 20Ω , inductance of 0.2H and capacitance of $100\mu F$ are connected in series across 220V, 50Hz main supply. Calculate: [5]
 i) Impedance ii) Current iii) Voltage across R, L and C
 iv) PF v) active power
- 10 Three similar coils each of resistance 20Ω and inductance of 0.5H are connected i) in star ii) in delta to a three phase, 50 Hz, 400V supply. Calculate the line current and the total power absorbed. [5]

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2073 Chaitra

Subject: Programming in C (CO304)

- Attempt all questions
- Candidates are required to answer the questions in their own words as far as possible.
- Assume suitable values, with stipulation, if necessary.
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- 1.a) What do you mean by Computer Network? Describe different type of computer network briefly. [1]
- b) Define the term compiler and interpreter. Write algorithm and flowchart of finding solution of quadratic equation. [2]
- 2.a) Describe arithmetic operators. Write a program to convert a given number of days into months and days. [2]
- b) What do you mean by looping? Describe the different types of loop with proper example. [5]
- 3.a) What do you mean by array? Describe the different approach of compile time initialization of one dimensional array. [5]
- b) Define recursive function. Write a program to calculate the $C(n,r)$ using the recursive function. [1]
- 4.a) Why we need a structure? Define a structure type, struct personal that would contain person name, date of Joining and salary. Using this structure, write a program to read this information for one person from the Terminal and print the same on screen. [5]

- b) Describe the pointer variable with its initialization. Write a program that describe the use of multiple indirection.
- 5.a) Define file in C programming. Describe the general format of declaration and opening of a file.
- b) What is dynamic memory allocation? Describe it with different function.

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Exam	Retake		
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Year/Part	I/I	Time	3 Hrs.

Subject: C programming

- *Attempt all questions*
- *Candidates are required to answer the questions in their own words as far as possible.*
- *Assume suitable values, with stipulation, if necessary.*
- *Figures in margin indicate full marks.*

- 1.a) Define computer. Describe different features of computer briefly.
- b) Write an algorithm and draw flowchart to read N numbers from user and display sum of all entered numbers.
- 2.a) What do you mean by the term Operator? Describe different types of operators based on utility with example.
- b) What do you mean by statements and preprocessor in c programming? Write down a program that show input statement and output statement.
- 3.a) What is the difference between while and do..while loop? Describe different types Conditional statements with syntax and proper example.
- b) What do you mean by two dimensional array? Write a program that read marks's percentage in an examination of ten students. Calculate and display the average percentage and deviation percentage from average of each student using array.
- 4.a) Briefly discuss the different categories of function? Describe two types of function. Write a program that Calculates factorial of given number using user defined function.
- b) Discuss about void pointer with example. Write a program to print the address of a variable along with its value.
- 5.a) Describe the syntax of Structure? Illustrate it with example. Describe about structures within structures.
- b) Write Short notes on below topics.
- i. Functions related to file ii. Defining a file

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Exam	Regular/Back		
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Year/Part	I/I	Time	3 Hrs.

Subject: Applied Mechanics (CE307)

- Candidates are required to answer the questions in their own words as far as possible.
- Assume suitable values, with stipulation, if necessary.
- Figures in margin indicate full marks.

1 (a) Define Engineering mechanics and its scope. Determine tension in cable BA and BC necessary to support the 60 kg cylinder as shown in the figure. 2p

Figure 1 (a)

(b) A plate measuring 6m×4m is acted upon by a set of forces in its plane as shown in figure. Determine the magnitude direction and position of resultant force. 4p

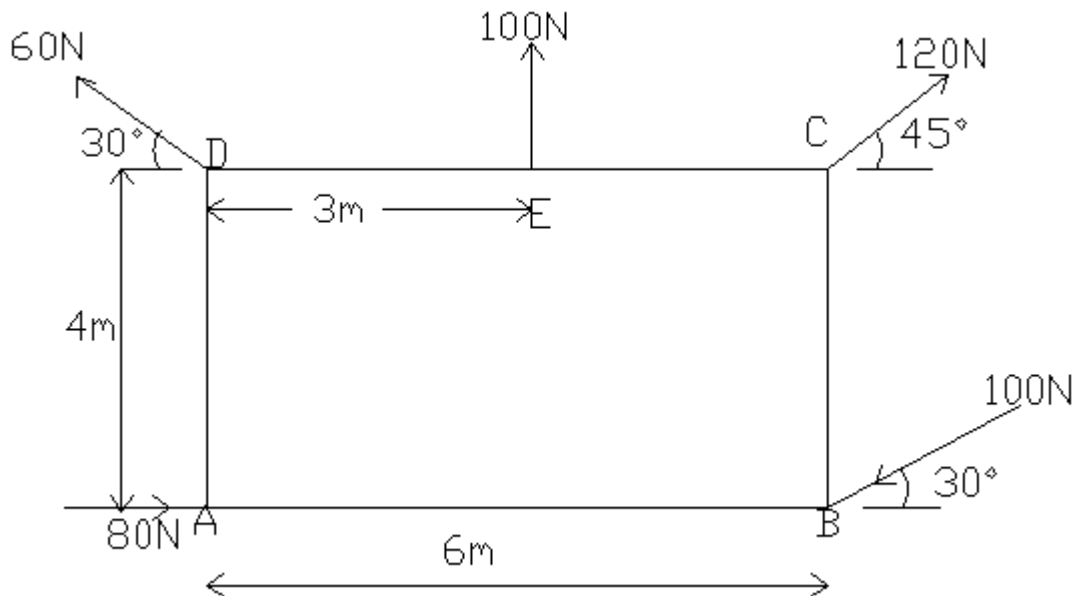


Figure 1 (b)

2 (a) State the laws of friction? Define the second moment of area and also determination of centroid of area of rectangle. 1+1

- (b) The acceleration of a particle is directly proportional to the time t . At time $t = 0$ sec, the velocity of the particle $V = -16$ m/s. knowing that both the velocity and the position coordinate are zero when $t = 4$ sec, write the equation of motion of particle. 6
- 3 (a) The bumper cars A and B in figure, each have a mass of 150 kg and are coasting with the velocities shown before they freely collide head on. If no energy is lost during the collision, determine their velocities after collision. 5
- Figure 3(a)*
- (b) A horse pulling a cart exerts a steady horizontal pull of 300 N and walks at the rate of 45 km/hour. How much work is done by the horse in 5 minutes? 5
- 4 (a) The ram R shown in Fig. 4(a) has a mass of 100 kg and is released from rest 0.75 m from the top of a spring, A, that has a stiffness $k_A = 12$ KN/m. If a second spring B, having a stiffness $k_B = 15$ KN/m, is "nested" in A, determine the maximum displacement of A needed to stop the downward motion of the ram. The unstretched length of each spring is indicated in the figure. Neglect the mass of the springs. 5
- Figure 4(a)*
- (b) Explain different types of planar motion of rigid bodies, with suitable diagrams. 5
- 5 (a) State and derive D'Alembert's principle. 3
- (b) Two smooth disks A and B, having a mass of 1 kg and 2 kg respectively, collide with the velocities shown in Fig. If the coefficient of restitution for the disks is $e = 0.75$, determine the x and y components of the final velocity of each disk just after collision. 3
- 6 Write short note (any two): 2+2
- (i) Simple relative motion
- (ii) Conservation of energy
- (iii) Impulsive motion

MIDWESTERN UNIVERSITY FACULTY OF ENGINEERING Examination Control Division	Exam	Regular/Back		
	Level	BE	Full Marks	50
	Program	Civil/Hydropower	Pass Marks	25
	Year/Part	I/I	Time	3 hrs.
2074 Chaitra				
Subject: Engineering Mathematics –I (SH 101)				

- Candidates are required to answer the questions in their own words as far as possible.
- Assume suitable values, with stipulation, if necessary.
- Figures in margin indicate full marks.

- 1 a i) Evaluate.
· ii) If show that

[2+3
]

and

- b. State and proved Rolle's theorem. Verify Rolle's theorem for the function $f(x)=$. [5]
- 2 a. i) Define differentiability of the function $f(x)$ at $x = a$. A function be defined by show that it is differentiable at $x = 0$ and find $f'(0)$. [3+2]
 ii) Using Maclauri's series show that]
- b. [2+3]
 i) Find radius of curvature at the point ,of the curve]
 ii. Define asymptotes of the curves with different types. Find asymptotes of .
- 3 a. i) Obtain the vertices, coordinates of foci, directrix, and eccentricity of the following hyperbola [2+3]
 ii) Show that the improper Integral.]
- b. Prove the reduction formula. [5]
 And also evaluate .
- OR**
- Evaluate by using the rule of differentiation under the sign of integration
- 4 a. i). What does the equation become when the axes are turned through an angle [2+3]
 ii). Show that the volume of the solid generated by revolving the asteroid about x- axis is .]
- b. Evaluate also deduce that . [5]
- 5 a. Show that is tangents to the ellipse and find the coordinates of point of contact. [4]
- b. i) Define the coplanar of vector function. Prove that the four points $(+5+)$, $(--)$, $(+9+4)$ and $(+4+4)$ are not coplanar. [3+3]
 ii) Find the volume of the parallelepiped whose sides represent, and . What can you infer about?]

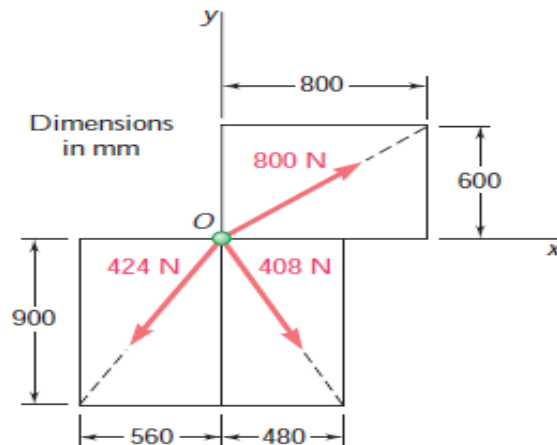
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Exam	Regular/Back		
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- Candidates are required to answer the questions in their own words as far as possible.
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- 1 (a) Explain briefly the importance of applied mechanics for computer engineers. 2
 (b) Determine the magnitude and direction of the resultant force of given figure. 4

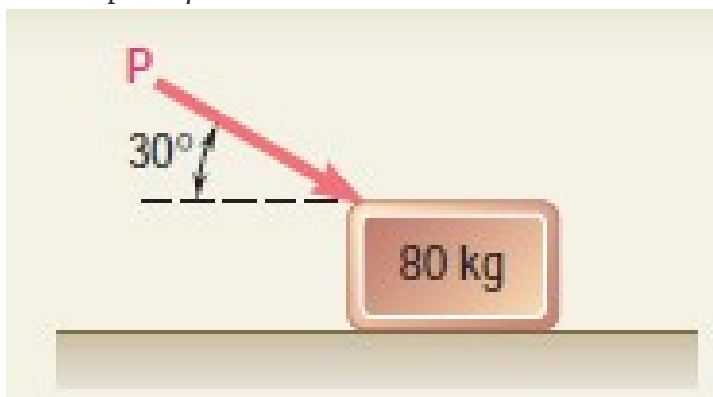


- 2 (a) A vertical pole is guyed by three cables PA, PB and PC tied at a common point P (0,15,0) above the ground. The base point of the cable are A(-4,0,-3), B(2,-2,5) and C(6,0,0). If the tensile force in the cables are adjusted to be 10, 15 and 20kN respectively. Make calculation for the force on the pole at P. 7

- (b) Determine by direct integration the location of the centroid of a parabolic spandrel. 5

- 3 (a) The motion of particle is defined by the position vector and; where is in meter and θ in radian. Determine the acceleration, velocity and radius of curvature at the instant 5

- (b) A 200kg block rests on a horizontal plane. Find the magnitude of the force P required to give the block an acceleration of 10m/s^2 to the right. The coefficient of kinetic friction between the block and the plane $\mu_k = 0.25$. 6



- 4 (a) A 600-g ball A is moving with a velocity of magnitude 6 m/s when it is hit as shown by a 1-kg ball B which has a velocity of magnitude 4 m/s. Knowing that the coefficient of restitution is 0.8 6

and assuming no friction, determine the velocity of each ball after impact.

- (b) Explain different types of planar motion of rigid bodies, with suitable diagrams. 4
-)
- 5 (a) An automobile weighing 4000kg is driven down a 5° incline at a speed of 60 when the 7
brakes are applied, causing a constant total braking force (applied by the road on the tires) of 1500 kg. Determine the distance traveled by the automobile as it comes to a stop.
- (b) Write short notes on (any two) 2x2
) (i) Free body diagram
(ii) Work energy principle.
(iii) Steady system of particles.



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Exam	Regular/Back		
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Year/Part	I/I	Time	3 Hrs.

Subject: Engineering Chemistry (SH 302)

- Candidates are required to answer the questions in their own words as far as possible.
- Assume suitable values, with stipulation, if necessary.
- Figures in margin indicate **full marks**.

1. (a) What is galvanic cell? Construct a galvanic cell formed by the combination of zinc electrode & copper electrode. Write the cell reaction and cell notation. ($E_{\text{Cu}^{++}/\text{Cu}} = 0.34 \text{ V}$ & $E_{\text{Zn}^{++}/\text{Zn}} = -0.76 \text{ V}$) (1+3+1+1)
- (b) Define catalyst? Mention the types of catalyst and their characteristics. (1+3)
2. (a) What is ozone layer? Give its photochemistry. (1+4)
- (b) What is inorganic polymer? Mention the preparation and application of polystyrene and teflon. (1+2+2)
3. (a) What are transition metals? Why Zn is not considered as typical transition metal? Mention the electronic configuration of Cr and Cu. (2+1+2)
- (b) Explain the formation of $[\text{Cu}(\text{NH}_3)_6]^{2+}$ ion on the basis of valence bond theory and predict its geometry and magnetic behaviour. (4+1)
4. (a) What are explosives? Give the preparation and uses of trinitrotoluene (TNT). (1+2)
- (b) What are paints? Write their functions. (1+1)
-)

(c) Define enantiomers. 'Meso compounds and racemic mixture both are optically inactive', give reason behind it. (1+4)

5. (a) What is nucleophilic substitution reaction? Compare SN¹ and SN² reaction conditions in alkyl halide showing the stereochemistry. (1+4)

(b) Explain the terms; buffer solution and Silicone (2.5+2.5)



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2073 Chaitra

Subject: Engineering Chemistry (SH 302)

- Candidates are required to answer the questions in their own words as far as possible.
- Assume suitable values, with stipulation, if necessary.
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1. (a) Define buffer solution? Mention its types. Explain the working mechanism for acidic buffer. (1+1+2)

(b) Calculate the p^H of a buffer solution when 200 ml of 0.1 M acetic acid mixed with 400 ml of 0.2 M sodium acetate solution. (p^{Ka} = 4.74) (2)

(c) Define negative catalyst? Mention the characteristic of catalyst. (2+2)

2. (a) What is soil pollution? Write its effects and possible remedies. (1+4)

(b) What is polymer? Mention its types based on carbon-carbon linkage. Mention the preparation and use of bakelite. (1+1+3)

3. (a) What are transition metals? Why do they have variable valency? Also discuss about the magnetic property of the compounds of the transition metals. (1+1+2)

(b) Write the postulates of Werner's theory. Explain the formation of [Cu(NH₃)₆]²⁺ ion on the basis of valence bond theory and predict its geometry and magnetic behaviour. (2+4)

4. (a) Define explosives and mention their types. (1+1)

(b) What are lubricants? Mention the functions of lubricants. (1+2)

- (c) What are optically active compounds? Define and explain enantiomers. (1+4)
5. (a) What is nucleophilic substitution reaction? Discuss the unimolecular nucleophilic substitution reaction mechanism in alkylhalide showing the stereochemistry. (1+4)
- (b) Explain the terms; electrode potential and Valence bond theory (2.5+2.5)

BEST OF LUCK

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Exam	Retake		
Level	BE	Full Marks	50
Program	Computer	Pass Marks	25
Year/Part	I/I	Time	3 Hrs.

Subject: Applied Mechanics

- Candidates are required to answer the questions in their own words as far as possible.
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- 1 (a) Find the magnitude of two forces, such that if they act at right angles, their resultant is 5 N. But, if they act at 60°, their resultant is 4 N. (5)
- (b) Define free body diagram. An electric light fixture weighting 15 N hangs from a point C, by two strings AC and BC. The string AC is inclined at 60° to the horizontal and BC at 45° to the horizontal as shown in figure. Determine the forces in the string AC and BC. (2+3)

Figure 2 (b)

- 2 (a) State parallel axis theorem, with a diagram. A body of weight 300 N is lying on a rough horizontal plane having a coefficient of friction of 0.3. Find the magnitude of the force, which can move the body, while acting at an angle of 25° with the horizontal. (2+3)
- (b) The position of the particle is given by $s = (2t^2 - 8t + 6)$ m, where “t” is in seconds. Determine the time when the velocity of the particle is zero, and the total distance traveled by the particle when $t = 3$ s. (5)

Figure 3 (b)

- 3 (a) Explain conservation of momentum. The 10 kg wheel shown in Fig. has a moment of inertia, $I_G = 0.156 \text{ kg} \cdot \text{m}^2$. Assuming that the wheel does not slip or rebound, determine the minimum velocity V_G it must have to just roll over the obstruction at A. (2+3)

Figure 4 (a)

- (b) A spring is stretched by 50mm by the application of the force. Find the work done, if the force required to stretch 1mm of the string is 10 N. (5)

- 4 (a) Explain different types of planar motion of a rigid body, with suitable diagrams. 5
- (b) The boats A and B travel with constant speeds of $V_A = 15$ m/s and $V_B = 10$ m/s when they leave the pier at O at the same time. Determine the distance between them when $t = 4$ s. 5

Figure 5 (b)

- 5 (a) An elevator of gross mass 500 kg starts moving upwards with a constant acceleration and acquires a velocity of 2m/s, after travelling a distance of 3 m. Find the pull in the cables during the accelerated motion. 5
- If the elevator, when stopping moves with a constant deceleration from a constant velocity of 2m/s and comes to rest in 2 sec, calculate the force transmitted by a man of mass 75kg on the floor during stopping.
- (b) State and derive an expression for the conservation of energy. 5

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Exam	Regular		
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Program	Computer	Pass Marks	25
Year/Part	I/I	Time	3 Hrs.

Subject: (Engineering Mathematics I) (SH501)

- Candidates are required to answer the questions in their own words as far as possible.
- Assume suitable values, with stipulation, if necessary.
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1	a	i	Find the derivative from the first principle of the following function: $y = \tan(ax + b)$.
		ii	If
2	b		State and prove Lagrange's mean value theorem.
	a	i	Using the L' Hospital's Rule, Evaluate:
		ii	Define asymptotes of the curve. Find the asymptotes of the given curve:
	b		Show that the radius of curvature at any point on the curve is .
3	a	i	Find the equation of tangent to the ellipse which are perpendicular to the straight line also find the point of contact.
		ii	Integrate:
	b		Show that: .

- 4 **a** *i* What does the equation become when the axes are turned through an angle to the original axes?
ii Find the area of the circle with radius .
- b** Define Beta and Gamma functions and use the Beta and gamma function to evaluate:
- 5 **a** *i* Solve the differential equation
- b** *i* Solve given that $x = 1$ when $t = 0$ and when $t = 0$.
- ii* Define the Bernoulli's equation. Solve the differential equation

Best of Luck....

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Exam	Retake		
Level	BE	Full Marks	50
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Year/Part	I/I	Time	3 Hrs.

2074 Kartik

Subject: Engineering Mathematics - I (SH301)

- Candidates are required to answer the questions in their own words as far as possible.
- Assume suitable values, with stipulation, if necessary.
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1 (a)

- i** Find the derivative from the first principle of the following function: $y = \log(\sin x)$. [2]
ii If = [3]

(b) State and prove Rolle's Theorem. [5]

2 (a)

- i** Using the L' Hospital's Rule, Evaluate: [2]
ii Find the asymptotes of the given curve: [3]

(b) Show that the radius of curvature at any point on the curve is . [5]

3 (a)

- i** Solve the differential equation [3]
i Evaluate the improper integral $\int dx$. [2]
i

(b) Obtain the reduction formula for $\int dx$ and hence evaluate $\int dx$. [5]

4 (a)

- i** Transform the equation to parallel axes through $(-2, 3)$. [2]

- i Find the volume of the solid formed by the revolution of the cardioid about the initial line. [3]
- i
- (b Define Beta and Gamma functions and use the gamma function to evaluate: [5]
-)
- 5 (a Solve the differential equation [4]
-)
- (b i Solve the differential equation [3]
-)
- i Find the equation of tangent to the ellipse at the point for which the eccentric angle is θ . Find [3]
- i also the equation of the normal at the same point.

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Exam	Regular/Back		
Level	BE	Full Marks	50
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Year/Part	I/I	Time	4 Hrs.

Subject: (Engineering Drawing) (ME501)

- ✓ *Attempt all questions.*
 - ✓ *Candidates are required to answer the questions in their own words as far as possible.*
 - ✓ *Assume suitable values, with stipulation, if necessary.*
 - ✓ *Figures in margin indicate full marks.*
- 1 Construct a regular Hexagon with 80 mm distance across flat. [3]
- 2 Draw an Ellipse with major and minor axes of 100 mm and 70 mm respectively? Use Concentric circle method. [3]
- 3 Draw an involute of a circle having diameter 54 mm. [3]
- 4 Draw three-view Orthographic drawing of **Fig 1**. [3]

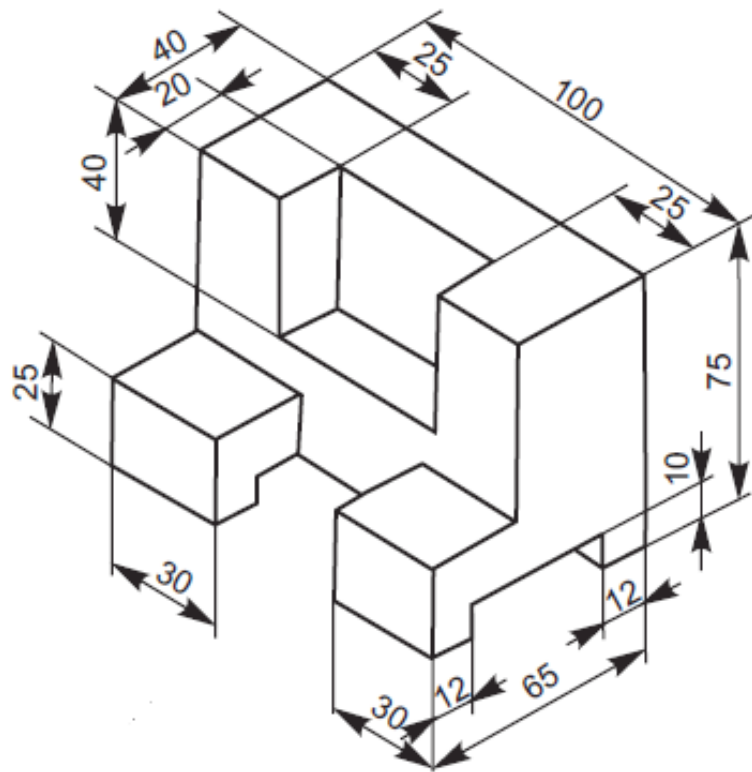


Fig 1

- 5 Draw the projection of following points/lines/surfaces. [2]
- Point A, 25 mm behind VP and 50 mm below HP.
 - Line BC, 40 mm long parallel to VP and inclined to HP at 40° , when one of its end is 20 mm from the HP and 25 mm from the VP.
- 6 Make a complete Orthographic drawing of a geometrical solid cut by a plane as in **Fig 2**. Find the true shape of the Section. Construct the development of the surface of the solid. [1]

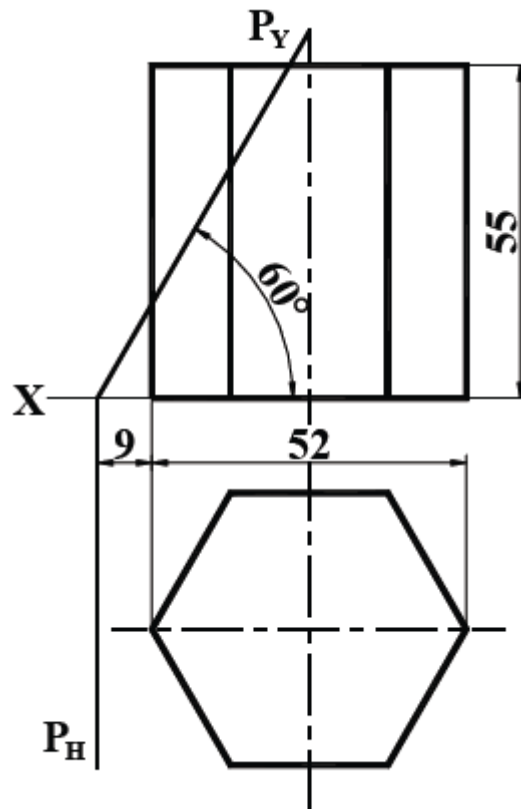


Fig 2

- 7 A square pyramid, side of base 30mm and height 50mm stands with its base on HP and base is parallel to VP and nearer to it. It is cut by a plane perpendicular to VP, inclined at 45° to HP and passing through a point on the axis, 35mm above the base. Draw the sectional top view and lateral surface.

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Best of Luck !!!

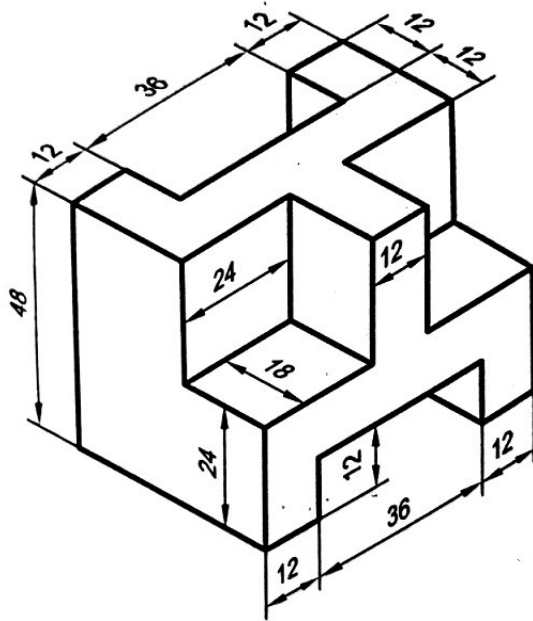
Exam	Regular/Back		
Level	BE	Full Marks	5
Program	Computer	Pass Marks	2
Year/Part	I/I	Time	4

Subject: Engineering Drawing (ME 501)

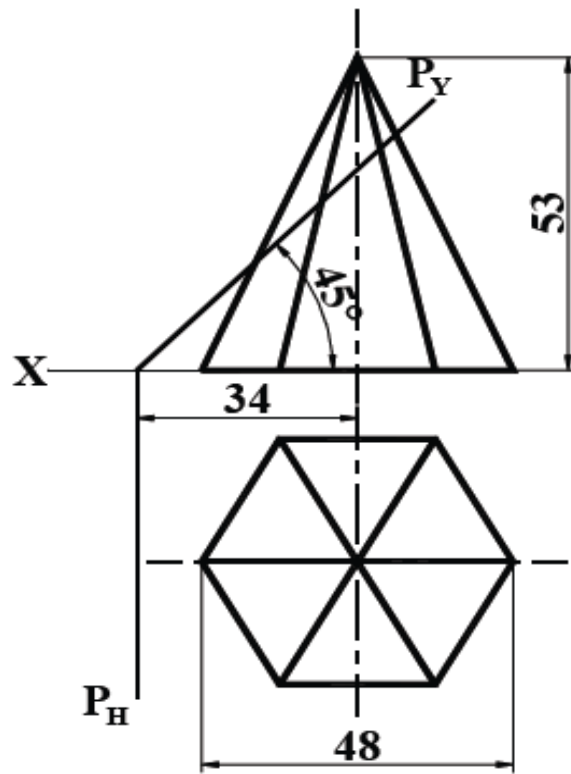
- ✓ Attempt all questions.
- ✓ Candidates are required to answer the questions in their own words as far as possible.
- ✓ Assume suitable values, with stipulation, if necessary.
- ✓ Figures in margin indicate full marks.

- 1 Construct a regular Octagon across corner of 85 mm.

- 2 Draw a Cycloid of circle having diameter of 40 mm. Also draw Tangent and Normal to any point on the curve.
- 3 Construct an Ellipse when its major and minor axes are 100 mm and 60 mm using Four Center Method.
- 4 The figure below contains pictorial view. Translate it into three-view Orthographic Projection.



- 5 Make a complete Orthographic drawing of the given geometric solid cut by a plane. Find the True Shape. Construct the development of the surface of the solid.



- 6 Figure below shows the details of a split bearing. Draw the assembled front view with section.
 . Take any length for the shaft.

