Hall Ticket Number :										

R-20

Code: 20A323T

I B.Tech. II Semester Supplementary Examinations December 2023

Engineering Mechanics

(Common to CE and ME)

Max. Marks: 70 Time: 3 Hours

****

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1.Answer ALL the following short answer questions (5 X 2 = 10M)	CO	BL
a) Define the term Free body diagram.	1	1
b) State the laws of friction.	2	2
c) State the Parallel axis theorem.	3	2
d) Differentiate between rectilinear motion and curvilinear motion.	4	2
e) State Work energy theorem**.**	5	2

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

	Marks	CO	BL

UNIT–I

2.	A light string ABCDE whose extremity A is fixed, has weights W_1 and W_2 attached to it at B and C. It passes round a small smooth peg at D carrying a weight of 300 N at the free end E as shown in Fig 1.If in a state of equilibrium, BC is horizontal and AB and CD make angles of 150^0 and 120^0 respectively with BC. Calculate (i) tensions in portions AB, BC, CD and DE of the string (ii) the value of weights W_1 and W_2 and (iii) pressure on peg D.	12M	1	3

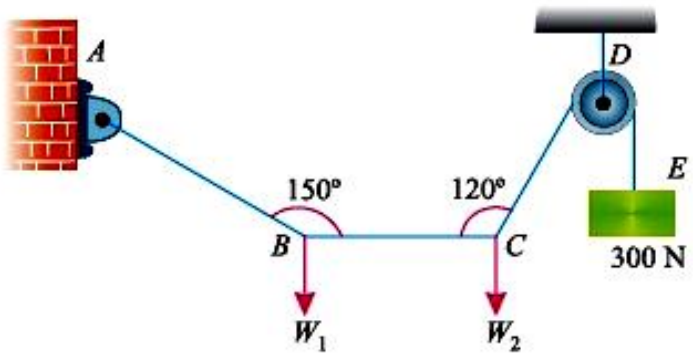


Fig.1

OR

3. a) Two cylinders P and Q rest in a channel as shown in Fig 2. The cylinder P has diameter of 100 mm and weighs 200 N, whereas the cylinder Q has diameter of 180 mm and weighs 500 N .If the bottom width of the box is 180 mm, with one side vertical and the other inclined at 60°, determine the pressures at all the four points of contact.

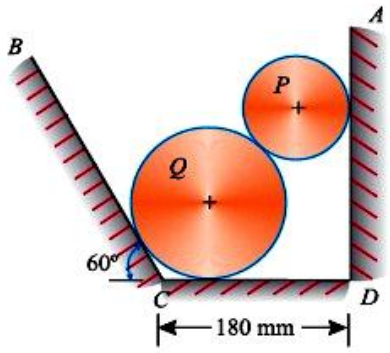


Fig.2 8M 1 3

b) Explain concept of equilibrium of coplanar force and noncoplanar systems. 4M 1 2

UNIT–II

4. A kingpost of truss of 8 m span is loaded as shown in Fig.3.Find the forces in each member of the truss and tabulate the results.

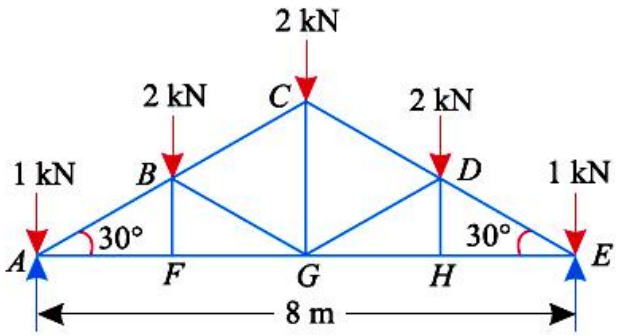


Fig.3 12M 2 3

OR

5. Two blocks A and B, connected by a horizontal rod and frictionless hinges are supported on two rough planes as shown in Fig. 4. 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?

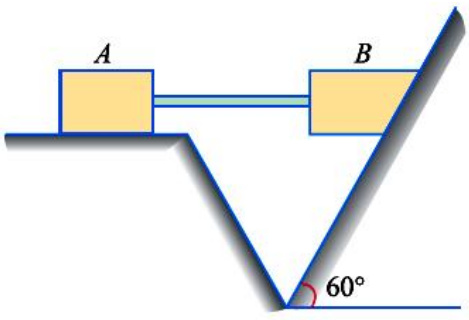


Fig.4 12M 2 2

UNIT–III

6. a) Determine the centroid of the shaded area formed by removing a semicircle of diameter ’r ’from a quarter circle of radius’r’ 5M 3 3

   b) Find the centroid of an unequal angle section 100 mm × 80 mm × 20 mm as shown in Fig. 5.

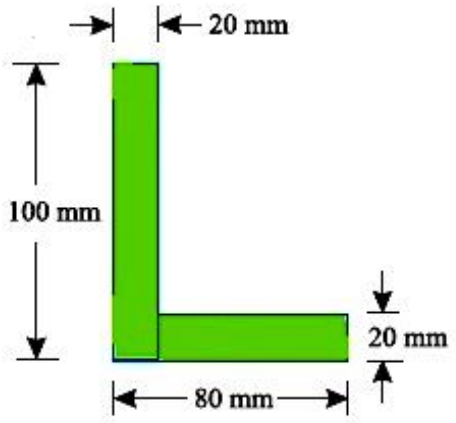


Fig.5 7M 3 3

OR

7. Determine I_{xx} and I_{yy} of the cross-section of a cast iron beam as shown in Fig.6.

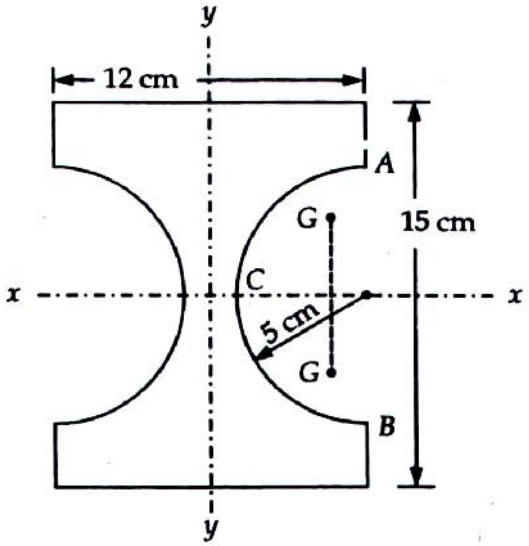


Fig.6 12M 3 3

UNIT–IV

8. a) A cage goes down a main shaft 750 m deep, in 45 s. For the first quarter of the distance only, the speed is being uniformly accelerated and during the last quarter uniformly retarded, the acceleration and retardation being equal. Find the uniform speed of the cage, while traversing the central portion of the shaft 6M 4 3

	b)	A particle is thrown with a velocity of 5 m/s at an elevation of 60° to the horizontal. Find the velocity of another particle thrown at an elevation of 45° which will have (a) equal horizontal range, (b) equal maximum height, and (c) equal time of flight.	6M	4	3
		OR			
9.	a)	A wheel rotates for 5 seconds with a constant angular acceleration and describes during this time 100 radians. It then rotates with a constant angular velocity and during the next five seconds describes 80 radians. Find the initial angular velocity and the angular acceleration	6M	4	3
	b)	An automobile enters a curved road at 30 km/hr and then leaves at 48 km/hr. The curved road is in the form of quarter of a circle and has a length of 400 m. If the car travels at constant acceleration along the curve, Calculate the resultant acceleration at both ends of the curve.	6M	4	3
		UNIT–V			
10.	a)	Explain the concept of D'Alembert's Principle.	4M	5	2
	b)	A body of weight 8 N is suspended by a light rope wound round a pulley of weight 60 N and radius 30 cm. The other end of the rope is fixed to the periphery of the pulley. If the weight is moving downwards, Calculate for the acceleration of 8 N weight and tension in the string.	8M	5	3
		OR			
11.	a)	Explain the conservation of momentum with a neat sketch.	4M	5	2
	b)	A body of 10 kg mass moving towards right with a speed of 8m/s strikes with another body of 20 kg mass moving towards left with 25 m/s. Determine: (i) final velocity of the two bodies (ii) loss in kinetic energy due to impact, and (iii) impulse acting on either body during impact. Take coefficient of restitution between the bodies as 0.65.	8M	5	3

*** End ***

Hall Ticket Number :										

R-20

Code: 20A321T

I B.Tech. II Semester Supplementary Examinations December 2023

Engineering Materials

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

****

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

			CO	BL
1.	**Answer ALL the following short answer questions**	(5 X 2 = 10M)		
	a) List the different imperfections in crystals.		1	L1
	b) State phase rule.		2	L2
	c) Give two applications of grey castiron and white castiron.		3	L1
	d) Define tempering.		4	L1
	e) List various methods to manufacture composites.		5	L1

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

			Marks	CO	BL
		UNIT–I			
2.	a)	Define crystal structure. Briefly write different types of crystal structures.	6M	1	L1
	b)	Explain any two types of imperfections.	6M	1	L2
		OR			
3.	a)	What is the necessity of alloying? Explain different intermediate alloy phases with suitable examples.	6M	1	L2
	b)	Explain substitutional solid solution and interstitial solid solution.	6M	1	L1
		UNIT–II			
4.		Explain the phase diagram of binary isomorphous alloy system.	12M	2	L1
		OR			
5.		Draw the Iron-Iron carbide (Fe-Fe_3C) diagram neatly and explain the phases present in the diagram.	12M	2	L2
		UNIT–III			
6.	a)	Explain high speed steel and stainless steel	6M	3	L1

	b)	Write about the composition, structure, properties and uses of white cast iron and Spheroidal graphite cast iron.	6M	3	L2
		OR			
7.	a)	Briefly explain the properties, compositions and application of Aluminium alloys.	6M	3	L1
	b)	Briefly explain the properties, compositions and application of Titanium alloys.	6M	3	L1
		UNIT–IV			
8.		What is heat treatment? Explain various heat treatment processes briefly.	12M	4	L1
		OR			
9.		Explain various surface treatment processes and their characteristics and applications.	12M	4	L1
		UNIT–V			
10.		Name, explain the properties and applications of any four types of ceramics.	12M	5	L1
		OR			
11.		What is a composite? Explain various types of composites.	12M	5	L1

*** End ***

Hall Ticket Number :										

R-20

Code: 20AC24T

I B.Tech. II Semester Supplementary Examinations December 2023

Engineering Physics

(Common to CE & ME)

Max. Marks: 70 Time: 3 Hours

****

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1. Answer ALL the following short answer questions (5 X 2 = 10M)		CO	BL
a) What is the physical significance of a curl of a vector?		CO1	L1
b) Define Absorption coefficient.		CO2	L1
c) What is Magnetic dipole moment?		CO3	L1
d) Explain Spontaneous emission and Stimulated emission.		CO4	L2
e) What is the use of a Bimetallic Strip?		CO5	L2

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

			Marks	CO	BL
		UNIT–I			
2.	a)	Explain Inertial and Non-Inertial Frames of reference	8M	CO1	L2
	b)	Discuss about Conservative Force.	4M	CO1	L3
		OR			
3.	a)	Outline Kepler's Laws qualitatively.	6M	CO1	L2
	b)	Derive F=-grad V.	6M	CO1	L3
		UNIT–II			
4.	a)	What is Reverberation and Reverberation time	4M	CO2	L2
	b)	Summarize the factors affecting Acoustics and their remedies	8M	CO2	L2
		OR			
5.	a)	Explain the production of Ultrasonics by Magneto Striction method.	6M	CO2	L2
	b)	How Non Destructive Testing Pulse echo system Transmission method works?	6M	CO2	L3
		UNIT–III			
6.	a)	Outline Lorentz method to determine the Internal field of a dielectric.	6M	CO3	L3

	b)	Explain Electronic Polarization in dielectrics.	6M	CO3	L2

OR

7.	a)	What is the Origin of Magnetic Moment? Explain.	6M	CO3	L2
	b)	What are the differences between Soft and Hard magnetic materials?	6M	CO3	L2

UNIT–IV

8.	a)	What are the Characteristics of Lasers	4M	CO4	L2
	b)	Explain the Construction and Working of Ruby Laser.	8M	CO4	L2

OR

9.	a)	What is the Basic Principle of Optical Fiber? Explain	4M	CO4	L2
	b)	Explain the Propagation of signal through optical fiber and derive the expressions for Acceptance Angle and Numerical Aperture.	8M	CO4	L2

UNIT–V

10.	a)	What are the different types of sensors and their applications?	6M	CO5	L2
	b)	Explain the working of Strain and Pressure sensors.	6M	CO5	L2

OR

11.	a)	How Fiber Optic Temperature Sensor works?	6M	CO5	L3
	b)	What is Hall effect? and How Hall Effect Sensor works?	6M	CO5	L3

*** End ***

Hall Ticket Number :										

R-20

Code: 20AC21T

I B.Tech. II Semester Supplementary Examinations December 2023

Differential Equations and Vector Calculus

(Common to all Branches)

Max. Marks: 70 Time: 3 Hours

****

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

		CO	BL
1.	Answer ALL the following short answer questions (5 X 2 = 10M)		
a)	Find the particular integral of $(D^2 - 2D + 1)y = e^{3x}$	1	2
b)	Write the second order Legendre's Linear Equation form	2	3
c)	Solve p-q=1	3	2
d)	Find curl F at the point (1,2,3) given F= $(x^2yz\bar{i} + xy^2z\bar{j} + xyz^2\bar{k})$	4	3
e)	State Gauss Divergence Theorem	5	3

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	BL
	UNIT–I			
2.	Solve $(D-2)^2y = e^{2x}[\sin 2x + x^2]$	12M	1	3
	OR			
3.	Solve $(D^2+3D+2)y = e^{-x} + x^2 + \cos x$	12M	1	3
	UNIT–II			
4.	Solve $x^2\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 4y = x^2 + 2\log x$	12M	2	3
	OR			
5.	An uncharged condenser of capacity C is charged by applying an e. m.f $\frac{E\sin t}{\sqrt{LC}}$ through leads of self-inductance L and negligible resistance, prove that at any time t, the charge on one of the plates is $\frac{EC}{2}\left\{\sin\frac{t}{\sqrt{LC}} - \frac{t}{\sqrt{LC}}\cos\frac{t}{\sqrt{LC}}\right\}$	12M	2	3
	UNIT–III			
6. a)	Form the partial differential equation by eliminating arbitrary functions f and g from $z = f(x+at) + g(x-at)$	6M	3	3
b)	Identify the appropriate form and solve $p^2 + q^2 = x + y$	6M	3	3

OR

7. Using the method of separation of variables solve $3\frac{\partial u}{\partial x} + 2\frac{\partial u}{\partial y} = 0, u(x,0) = 4e^{-x}$ — 12M | 3 | 3

UNIT–IV

8. a) Find the directional derivative of $f = x^2 - y^2 + 2z^2$ at the point p(1,2,3)in the direction of the line PQ. Where Q is the point $(5,0,4)$ — 6M | 4 | 3

   b) Find div F and Curl F where F= grad $(x^3 + y^3 + z^3 - 3xyz)$ — 6M | 4 | 3

OR

9. $\vec{F} = (x^2 - yz)\vec{i} + (y^2 - zx)\vec{j} + (z^2 - xy)\vec{k}$ Identify whether the above vector is irrotational or not. If so, find its scalar potential — 12M | 4 | 3

UNIT–V

10. Using Green's theorem evaluate $\int_C (y - \sin x)dx + \cos y\,dy$ where C is the plane triangle enclosed by the lines $y = 0, x = \frac{\pi}{2}$ and $y = \frac{2x}{\pi}$ — 12M | 5 | 3

OR

11. Apply stokes theorem to evaluate $\int_C y\,dx + z\,dy + x\,dz$ where C is the curve of intersection of $x^2 + y^2 + z^2 = a^2$ and $x + z = a$ — 12M | 5 | 3

*** End ***

Hall Ticket Number :										

R-20

Code: 20A322T

I B.Tech. II Semester Supplementary Examinations December 2023

Engineering Graphics & Design

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

****

		Marks	CO	BL
	UNIT–I			
1.	A hexagonal pyramid of base side 30 mm and axis 60 mm is lying on a slant edge on the HP with the axis is inclined at 20^0 to VP. Draw its projections.	14M	CO1	L2
	OR			
2.	A pentagonal prism, side of base 25mm and axis 50mm long, rests with one of its edges on HP such that the base containing that edge makes an angle of 30^0 to HP and its axis is inclined at 30^0 to VP. Draw its projections.	14M	CO1	L2
	UNIT–II			
3.	A cylinder of base diameter 50 mm and axis 70 mm is lying on a generator on the HP with its axis parallel to the VP. It is cut by an auxiliary inclined plane inclined at 30^0 to the HP passing through a point on the axis 30 mm from one of its ends. Draw its sectional top view and obtain true shape of the section.	14M	CO2	L3
	OR			
4.	A hexagonal pyramid of 25 mm edge of base and axis 50 mm long is resting on its triangular face in the HP with its axis parallel to the VP. It is cut by a section plane perpendicular to the HP and inclined at 30^0 to VP, and passing through a point on the axis 20 mm from the base. Draw the top view, sectional front view and true shape of the section when the apex is removed.	14M	CO2	L3
	UNIT–III			
5.	A triangular prism, side of base 30 mm and height 40 mm, stands on the HP on its base with a rectangular face perpendicular to the VP. It is cut by a plane perpendicular to the VP, inclined at 30^0 to the HP and passing through a point 20 mm above the base along the axis. Draw the development of the lower portion of the prism.	14M	CO3	L3
	OR			
6.	A square prism with 50 mm sides at its base and an axis of 90 mm length, is resting on its base with an edge of the base inclined at 30^0 to the VP. It is completely penetrated by a horizontal cylinder 50 mm in diameter and 90 mm in length. The axes of both the solids are parallel to the VP and bisects each other. Draw the projections showing the curves of intersections.	14M	CO3	L3

UNIT–IV

7. a) Draw the isometric projection of cone of base diameter 50 mm and altitude 70 mm when the base is on HP. 6M CO4 L2

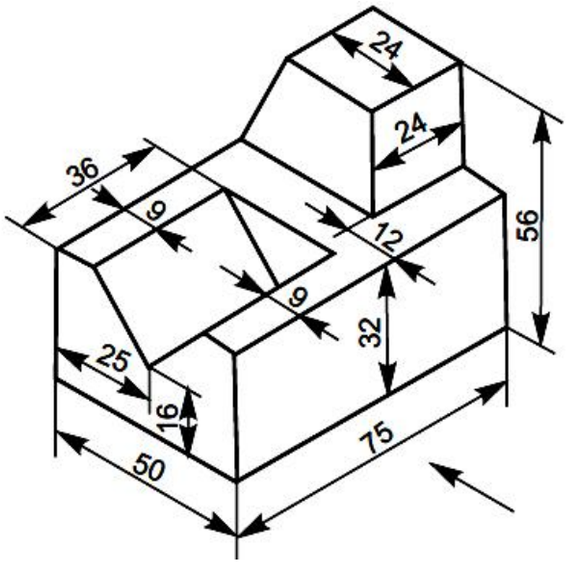
   b) Draw the isometric projection of a cylinder of 80 mm diameter and 100 mm long with a 20 mm coaxial square hole. The cylinder is lying on HP with its axis parallel to VP and the sides of hole making an angle of 45^0 with HP. 8M CO4 L2

OR

8. A pedestal consists of a square slab, side of base 60 mm and thickness 20 mm, surmounted by a frustum of a square pyramid, side of base 40 mm, that at top 20 mm and height 60 mm, which is surmounted by a square pyramid having side of base 20 mm and height 40 mm. All three solids are coaxial and are similarly situated. Draw the isometric view of the pedestal. 14M CO4 L3

UNIT–V

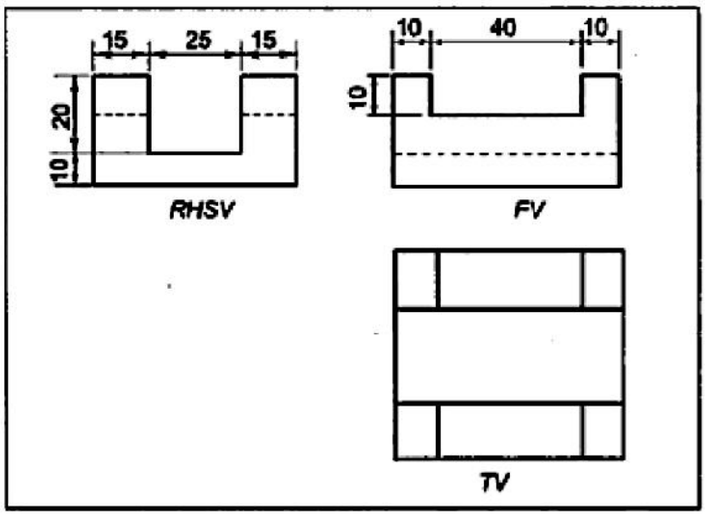
9. Draw the front view, top view and left side view for the following figure. (Dimensions are in mm).



14M CO5 L4

OR

10. Three views of an object are shown in figure. Make an isometric drawing of the object. (Dimensions are in mm).



14M CO5 L4

*** End ***