Hall Ticket Number :										

R-20

Code: 20A323T

I B.Tech. II Semester Supplementary Examinations February 2023

Engineering Mechanics

(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 mark.**
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)	What is meant by composition and resolution of forces?	**1**	**1**
b)	What is the difference between coefficients of static and kinetic friction?	**2**	**2**
c)	What do you mean by first moment of area and second moment of area?	**3**	**2**
d)	Write the equations of plane motion of a rigid body.	**4**	**1**
e)	Define impulse and momentum. State impulse-momentum principle in translation.	**5**	**1**

PART-B

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

		Marks	CO	BL
	UNIT–I			
2.	State and prove Varignon's theorem applied to concurrent forces.	12M	1	2
	OR			
3.	The force system shown in Figure 1 has a resultant of 200 N pointing up along the Y-axis. Compute the values of F and θ required to give this resultant. Assume the units of forces in Newtons.			

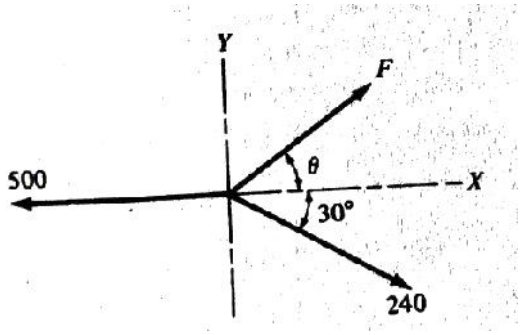

Figure 1 12M 1 3

	UNIT–II			
4.	Two identical blocks A and B are connected by a rod and rest against vertical and horizontal planes, respectively, as shown in Figure 2. If sliding impends when θ = 45^0, determine the coefficient of friction μ, assuming it to be the same at both floor and wall.	12M	2	3

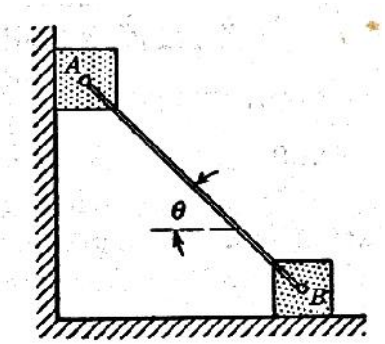

Figure 2

OR

5. Find the forces in all the members of the truss shown in Figure 3.

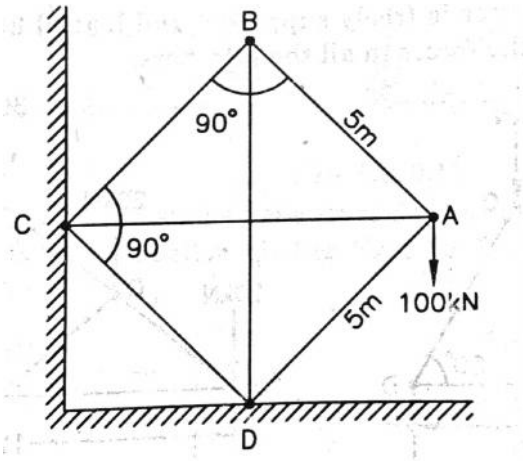

Figure 3 12M 2 3

UNIT–III

6. Determine the centroid of the shaded triangular area shown in Figure 4 with respect to the given X and Y – axes. Assume the units in figure in meters.

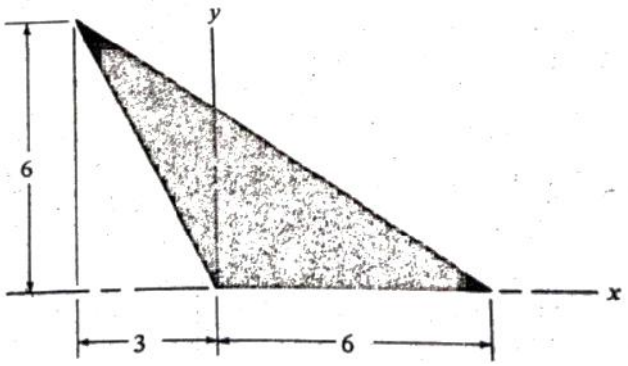

Figure 4 12M 3 3

OR

7. Calculate the moment of inertia I_{xx} of a homogeneous right circular cone with respect to an axis X through the vertex and parallel to the plane of the base. 12M 3 3

UNIT–IV

8. a) Define normal and tangential components of accelerations. Write the equations. 4 4 2

   b) The pilot of an airplane A flying horizontally with constant speed *v* = 450 kmph at an elevation h = 600 m above a level plain wishes to bomb a target B on the ground (Figure 5). At what angle **θ** below the horizontal should he see the target at the instant of releasing the bomb in order to score a hit?

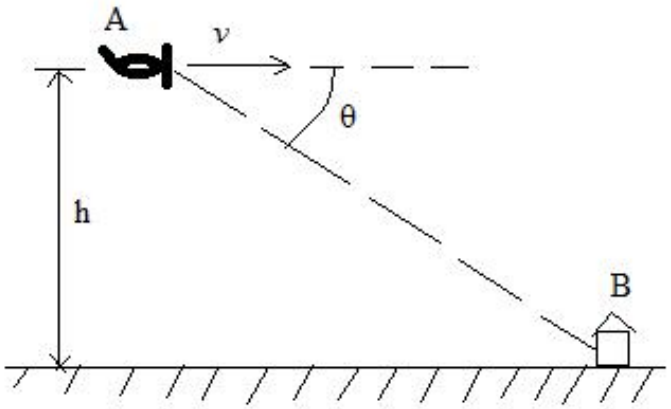

Figure 5 8 4 3

OR

9. a) What is instantaneous center of rotation of a rigid body making plane motion? Explain with an example. 6M 4 2

   b) A locomotive runs along a straight level track with constant acceleration a = 0.2g. Find the total acceleration of a point at the top of the rim of a driver wheel of radius r = 1 m when the speed of the locomotive is 25 kmph. 6M 4 3

UNIT–V

10. a) State and prove Impulse – Momentum principle. 6M 5 2

    b) A locomotive weighing 60 tons has a velocity of 15 kmph and backs into a freight car weighing 10 tons that is at rest on a level train track. After the coupling is made, with what velocity '*v*' will the entire system continue to move? 6M 5 3

OR

11. A solid circular cylinder and a sphere are started from rest at the top of an inclined plane at the same time, and both roll without sliding down the plane. If, when the sphere reaches the bottom of the incline, the cylinder is 12 m behind it, what is the total length S of the incline? 12M 5 3

*** End ***

Hall Ticket Number :										

R-20

Code: 20AC24T

I B.Tech. II Semester Supplementary Examinations February 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 mark.**
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) Give examples of inertial and non-inertial frames of reference. CO1 L1

b) Classify A, B and C scan displays? CO2 L4

c) Define is Weiss domain theory of ferromagnetism? CO3 L1

d) State and explain in brief the principle of communication through optical fibers. CO4 L2

e) Mention two application of 'Hall effect' as a sensor'. CO5 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) Given $\phi = 2x^2 + 3y^3 - 4z$, determine gradϕ, div(gradϕ), curl(gradϕ) 8M CO1 L3

b) What is Foucault's pendulum and where is it applied? 4M CO1 L3

OR

3. a) Discuss Newton's laws of motion in rotating frame of reference. 4M CO1 L2

b) Explain the terms center of mass, torque and newton's laws of motion in a frame of reference with constant angular velocity. 8M CO1 L3

UNIT–II

4. a) Derive Sabine's formula using growth and decay method and mention two methods to determine acoustic absorption coefficient. 6M CO2 L6

b) Analyze the method of magneto strictive ultrasonic production. 6M CO2 L4

OR

5.	a)	Enumerate the factors and concerned remedies for an acoustically good building.	4M	CO2	L1
	b)	What is pulse echo system? Explain how is it used in transmission and reflection modes for nondestructive testing.	8M	CO2	L4

UNIT–III

6.	a)	What is Polarisability and derive an expression for ionic polarisabilty of an ionic substance.	6M	CO3	L6
	b)	What is magnetic moment and derive an expression for Bhor magneton.	6M	CO3	L6

OR

7.	a)	What are the different types of polarization mechanisms? When radii two atoms are in the ratio 1:3 what is the electronic polarization ratio of the two atoms and why.	8M	CO3	L4
	b)	Differentiate hard and soft magnetic materials along with a hysteresis curve.	4M	CO3	L4

UNIT–IV

8.	a)	Deduce a relation between Einstein's coefficients.	6M	CO4	L6
	b)	Differentiate optical fibers based on the refractive index profile	6M	CO4	L4

OR

9.	a)	Explain the terms population inversion, pumping mechanism and justify why population inversion is required for lasing action.	6M	CO4	L5
	b)	What is acceptance angle and evaluate what happens to the numerical aperture value of the given fiber if is used in water of refractive index 1.33 in comparison to using in air.	6M	CO4	L5

UNIT–V

10.	a)	What is a sensor and what are the basic components in a sensor?	6M	CO5	L1
	b)	Explain active and passive optical fiber sensors and device an optical fiber pressure sensor.	6M	CO5	L6

OR

11.	a)	What is magneto striction and outline the working of magneto strictive sensor.	6M	CO5	L4
	b)	Explain the construction and working of bimetallic strip temperature sensor.	6M	CO5	L2

*** End ***

Hall Ticket Number :										

R-20

Code: 20AC21T

I B.Tech. II Semester Supplementary Examinations February 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 mark.**
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) Find the P.I of $(D^2-2D+4)\,y = e^x \cos x$ CO1 L2

b) Solve $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = \log x$ CO2 L3

c) Find the partial differential equation of all planes passing through the origin. CO3 L2

d) Find $\nabla\left(\nabla.\frac{\bar{r}}{r}\right)$ CO4 L2

e) State Stokes theorem. CO5 L3

PART-B

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

Marks CO BL

UNIT–I

2. Solve $(D^2-4D+4)\,y = 8x^2 e^{2x} \sin 2x.$ 12M CO1 L3

OR

3. Solve, by the method of Variation of Parameters, $y''-2y'+y = e^x \log x$ 12M CO1 L3

UNIT–II

4. In an L-C-R circuit, the charge q on a plate of a condenser is given by $L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = E\sin pt$. The circuit is tuned to resonance so that $p^2 = 1/LC$. If initially the current i and the charge q be zero, show that, for small values of R/L, the current in the circuit at time t is given by $(Et/2L)\sin pt.$ 12M CO2 L3

OR

5. Solve $(2x-1)^2\frac{d^2y}{dx^2}+(2x-1)\frac{dy}{dx}-2y=8x^2-2x+3$ — 12M CO2 L1

UNIT–III

6. a) Form the partial differential equation by eliminating the arbitrary function from $\phi\left(\frac{y}{x},\ x^2+y^2+z^2\right)=0.$ — 6M CO3 L2

   b) Solve the partial differential equation $\frac{p}{x^2}+\frac{q}{y^2}=z.$ — 6M CO3 L3

OR

7. Use Separation of Variables to solve $4u_x+u_y=3u$ with $u(0,y)=3e^{-y}-e^{-5y}.$ — 12M CO3 L3

UNIT–IV

8. a) Find the values of a and b so that the surfaces $ax^2-byz=(a+2)x$ and $4x^2y+z^3=4$ may intersect orthogonally at the point $(1,-1,2)$. — 6M CO4 L2

   b) Show that $\frac{\bar{r}}{r^3}$ is solenoidal. — 6M CO4 L3

OR

9. a) Find constants a, b, c so that the vector $\bar{A}=(x+2y+az)\bar{i}+(bx-3y-z)\bar{j}+(4x+cy+2z)\bar{k}$ is irrotational. Also find ϕ such that $\bar{A}=\nabla\phi$ — 6M CO4 L2

   b) Prove that $\text{div curl}\,\bar{f}=0.$ — 6M CO4 L3

UNIT–V

10. Evaluate $\iint_S \bar{F}.\bar{n}\,ds$ where $\bar{F}=12x^2y\bar{i}-3yz\bar{j}+2z\bar{k}$ and S is the portion of the plane $x+y+z=1$ included in the first octant. — 12M CO5 L5

OR

11. Verify Green's theorem for $\int_c\left[(3x^2-8y^2)dx+(4y-6xy)dy\right]$ where c is the region bounded by $x=0,\ y=0$ and $x+y=1.$ — 12M CO5 L5

*** End ***

Hall Ticket Number :										

R-20

Code: 20A321T

I B.Tech. II Semester Supplementary Examinations February 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 mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

			CO	Blooms Level
1.	**Answer ALL the following short answer questions**	(5 X 2 = 10M)		
a)	Draw the unit cell of FCC and BCC Crystal Structures		**CO1**	**L2**
b)	Give two examples for eutectic systems		**CO2**	**L2**
c)	Mention any two applications of high carbon steels		**CO3**	**L1**
d)	Define hardenability		**CO4**	**L1**
e)	List any two advantages of hand layup process		**CO5**	**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)	Explain the process of crystallization in pure metals	6M	CO1	L2
	b)	Illustrate the process of calculation of grain size using planimetric method	6M	CO1	L3
		OR			
3.	a)	Write about electron compounds and intermediate alloy phases?	6M	CO1	L1
	b)	State Hume Rothery's rules for the formation of substitutional type of solid solutions.	6M	CO1	L2
		UNIT–II			
4.	a)	Explain the isomorphous system with an example of Copper Nickel System	6M	CO2	L2
	b)	What is the use of lever Rule	6M	CO2	L1
		OR			
5.	a)	Explain the eutectic and eutectoid reactions in the Fe - Fe3C equilibrium diagram	6M	CO2	L2
	b)	Explain how the equilibrium diagrams are constructed with help of an example	6M	CO2	L2

UNIT–III

6.	a)	Explain composition, microstructure, properties and applications of any two cast irons.	6M	CO3	L2
	b)	Write a note on Hadfield manganese steels and low alloy steels	6M	CO3	L1
		OR			
7.	a)	Differentiate between austenitic stainless steel and martensitic stainless steels	6M	CO3	L2
	b)	What are the elements in Grade 5 Titanium Alloy. Mention their applications	6M	CO3	L2

UNIT–IV

8.	a)	Distinguish between annealing and normalizing of steels.	6M	CO4	L2
	b)	Explain the induction hardening process with the help of a sketch	6M	CO4	L2
		OR			
9.	a)	Explain Nitriding of steels? State the advantages and disadvantages of Nitriding treatment over carburizing treatment	6M	CO4	L2
	b)	List the ferrite and austenite stabilizers in the iron carbon diagram	6M	CO4	L1

UNIT–V

10.	a)	Explain the role are matrix and reinforcement in composites	6M	CO5	L2
	b)	Compare the properties of crystalline ceramics and glass ceramics	6M	CO5	L2
		OR			
11.	a)	What are C- C composites? List their applications	6M	CO5	L2
	b)	What are cermets? Mention their applications	6M	CO5	L2

*** End ***