Hall Ticket Number :										

R-20

Code: 20AC21T

I B.Tech. II Semester Regular Examinations October 2021

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)

			CO	Blooms Level
1.	**Answer ALL the following short answer questions**	(5 X 2 = 10M)		
a)	Evaluate $\frac{1}{D^2-4D+4}xe^{2x}$.		CO1	L2
b)	Solve the Euler's equation $x^2\frac{d^2y}{dx^2}+3x\frac{dy}{dx}+y=0$.		CO2	L3
c)	Find the general solution of $p+q=pq$		CO3	L2
d)	Prove that $\nabla.\bar{r}=3$		CO4	L3
e)	State Green's theorem.		CO5	L3

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

		Marks	CO	Blooms Level
	UNIT–I			
2.	Solve $\left(D^2-4D\right)y=e^x+\sin 3x\cos 2x.$	12M	CO1	
	OR			
3.	Solve the following equation by the method of variation of parameters $\left(D^2+3D+2\right)y=e^x+x^2$	12M	CO1	
	UNIT–II			
4.	Solve $(1+2x)^2\frac{d^2y}{dx^2}-6(1+2x)\frac{dy}{dx}+16y=8(1+2x)^2$	12M	CO2	
	OR			
5.	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 $p^2=\frac{1}{LC}$. 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 $\frac{Et}{2L}\sin pt$	12M	CO2	

UNIT–III

6. a) Solve $p(1+q)=qz$ — 6M CO3

   b) Solve $x(z^2-y^2)p+y(x^2-z^2)q=z(y^2-x^2)$ — 6M CO3

OR

7. Solve by the method of separation of variables
   $u_x=2u_t+u$ where $u(x,0)=6e^{-3x}$ — 12M CO3

UNIT–IV

8. a) Fine the directional derivative of $\phi(x,y,z)=xy+yz+zx$ in the direction of $-2\vec{i}+\vec{j}+2\vec{k}$ at the point (1, 2, 0). — 6M CO4

   b) Find the angle between the surfaces
   $x^2+y^2+z^2=12$ and $x^2+y^2-z=12$ at $(2,2,2)$. — 6M CO4

OR

9. a) Find the constant a, b and c such that the vector field defined by $\vec{F}=(4xy+az^3)\vec{i}+\left(bx^2+3z\right)\vec{j}+(6xz^2+cy)\vec{k}$ is irrotational. With these values of a, b and c determine a scalar function ϕ such that $\vec{F}=\nabla\phi$. — 8M CO4

   b) Prove that $\nabla\left(\frac{\vec{r}}{r^3}\right)=0$ — 4M CO4

UNIT–V

10. Verify Gauss's divergence theorem for $\vec{F}=\left(x^2-yz\right)\vec{i}+(y^2-zx)\vec{j}+(z^2-xy)\vec{k}$ take over the rectangular parallelepiped $0\le x\le a, 0\le y\le b, 0\le z\le c$. — 12M CO5

OR

11. Verify Stokes' theorem for the vector field $\vec{F}=(2x-y)\vec{i}-yz^2\vec{j}-y^2z\vec{k}$ over the upper half surface of $x^2+y^2+z^2=1$ bounded by its projection on the *xy*-plane. — 12M CO5

*** End ***

Hall Ticket Number :										

R-20

Code: 20A322T

I B.Tech. II Semester Regular Examinations October 2021

Engineering Graphics & Design

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

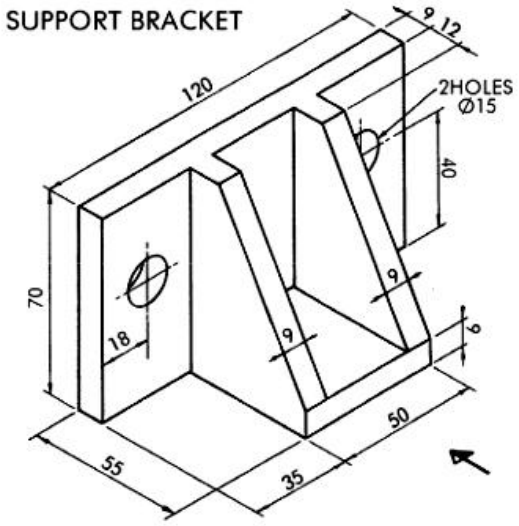
Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

****

		Marks	CO	Blooms Level
	UNIT–I			
1.	Draw the projections of a pentagonal prism, base 25 mm side and axis 50 mm long, resting on one of its rectangular faces on the V.P., with the axis inclined at 45^0 to the H.P.	14M	CO1	L2
	OR			
2.	A Hexagonal Pyramid, base 30mm side and 60mm long axis, has an edge of its base on the ground and the axis is inclined at 30° to HP. The edge of the base on which it rests is inclined at 45° to VP. Draw its projections.	14M	CO1	L2
	UNIT–II			
3.	A cylinder of base diameter 45mm and axis length 60 mm is resting on HP on one of its base with its axis perpendicular to VP. It is cut by a plane inclined 30° to HP and perpendicular to VP and is bisecting the axis of the cylinder. Draw its front view, sectional top view and true shape of section.	14M	CO2	L3
	OR			
4.	A hexagonal prism of base side 30 mm and axis length 60 mm is resting on HP on one of its bases with two of the vertical faces perpendicular to VP. It is cut by a plane inclined at 60^0 to HP and perpendicular to VP and passing through a point at a distance 12 mm from the top base. Draw its front view, sectional top view and true shape of section.	14M	CO2	L3
	UNIT–III			
5.	A hexagonal pyramid with side of base 30 mm and height 75 mm stands with its base on HP and an edge of the base parallel to V.P. It is cut by a plane perpendicular to VP, inclined at 45° to H.P and passing through the mid-point of the axis. Draw the top view and develop the lateral surface of the truncated pyramid	14M	CO3	L2
	OR			
6.	Draw the development of the lateral surface of the frustum of the square pyramid of side of base 30 mm and axis 40 mm, resting on HP with one of the base edges parallel to V.P. It is cut by a horizontal cutting plane at a height of 20 mm.	14M	CO3	L2
	UNIT–IV			
7.	A pentagonal pyramid of side of base 30mm and height 70mm is resting with its base on H.P. Draw the isometric drawing of the pyramid.	14M	CO4	L3
	OR			
8.	Draw the isometric view of a pentagonal prism of base 60mm side, axis 100 mm long and resting on its base with a vertical face perpendicular to V.P.	14M	CO4	L3

UNIT–V

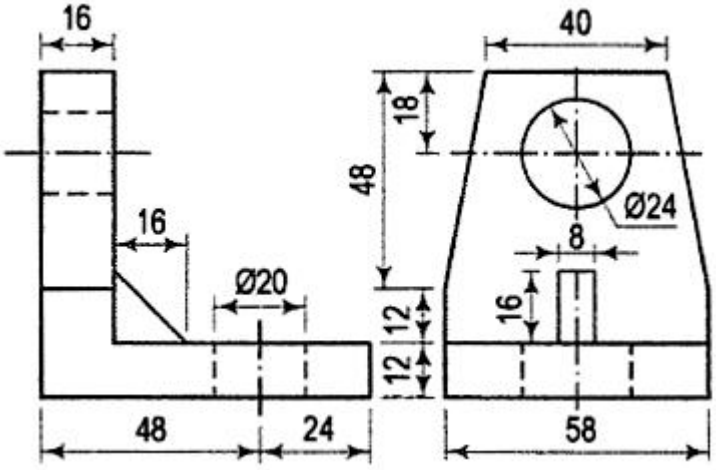
9. Draw the front view, top view and right side view for the following figure



14M CO5 L4

OR

10. Draw the isometric view for the following figure



14M CO5 L4

*** End ***

Hall Ticket Number :										

R-20

Code: 20A321T

I B.Tech. II Semester Regular Examinations October 2021

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)	What is solid solution?	CO1	L1
b)	What is phase rule?	CO2	L1
c)	Why aluminium has silver white luster whereas copper has reddish brown.	CO3	L2
d)	Describe age hardening.	CO4	L1
e)	What is matrix in composite materials? What are the various types of matrices used in composite materials?	CO5	L1

PART-B

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

			Marks	CO	Blooms Level
		UNIT–I			
2.	a)	Calculate the atomic packing for FCC and BCC crystal structure.	6M	CO1	L2
	b)	Discuss the effect of grain size on mechanical properties?	6M	CO1	L2
		OR			
3.	a)	Distinguish between substitutional and interstitial solid solutions?	6M	CO1	L2
	b)	What do you mean by intermediate alloy phase? Explain any one type of intermediate alloy phase with suitable example?	6M	CO1	L2
		UNIT–II			
4.	a)	Draw and explain the cooling curves for alloy-solid solution type and alloy-eutectic type.	6M	CO2	L2
	b)	Explain Peritectic system and Eutectoid system with neat sketches.	6M	CO2	L2
		OR			
5.		Explain equilibrium diagram of Fe-Fe_3C and label all important points, lines and phases in it.	12M	CO2	L2
		UNIT–III			
6.	a)	Differentiate between gray and Spheroidal graphite cast irons giving their application?	6M	CO3	L2
	b)	What properties are desirable in tool and die steels?	6M	CO3	L2
		OR			
7.	a)	What is stainless steel? How are they classified? Give their applications?	6M	CO3	L2
	b)	State the difference between brass and bronze?	6M	CO3	L2
		UNIT–IV			
8.	a)	Explain the significance of TTT diagram in heat treatment of steel?	6M	CO4	L2
	b)	Describe the process of hardening?	6M	CO4	L2
		OR			
9.	a)	Explain the need of surface hardening?	6M	CO4	L2
	b)	Describe the principle of flame hardening and induction hardening?	6M	CO4	L2
		UNIT–V			
10.	a)	What are the outstanding properties of glass? State their applications?	6M	CO5	L2
	b)	How ceramic components are formed? Explain.	6M	CO5	L2
		OR			
11.	a)	Explain Partial reinforced composites and Dispersion strengthened composites?	6M	CO5	L2
	b)	What are the properties of composites that make them suitable for aerospace applications?	6M	CO5	L2

*** End ***

Hall Ticket Number :										

R-20

Code: 20A323T

I B.Tech. II Semester Regular Examinations October 2021

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**

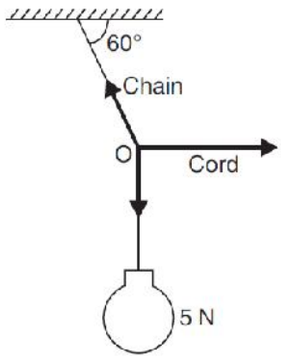
PART-A
(Compulsory question)

		CO	Blooms Level
1.	**Answer ALL the following short answer questions (5 X 2 = 10M)**		
a)	Is there a difference between the number of general equilibrium equations available for a concurrent and for a non-concurrent system of coplanar forces? Explain.	1	2
b)	State Varignon's theorem.	2	2
c)	Can the centroid of a volume coincide with the centroid of its cross section? Explain with example.	3	2
d)	Define angular displacement angular velocity angular acceleration	4	1
e)	A rocket of weight 24 N is fired by an army man by using a portable rocket launcher of weight 180 N. If the rocket launcher is recoiled with a velocity of 0.8 m/sec, determine the velocity of rocket during launching.	5	2

PART-B

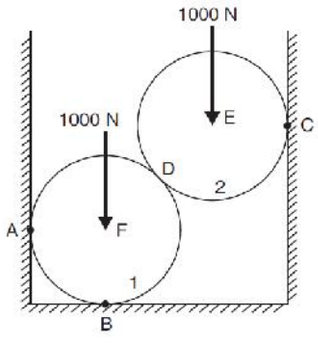
Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	Blooms Level
	UNIT–I			
2.	A lamp weighing 5 N is suspended from the ceiling by a chain. It is pulled aside by a horizontal cord until the chain makes an angle of 60° with the ceiling as shown in Fig. Find the tensions in the chain and the cord by applying Lami's theorem.	12M	1	3



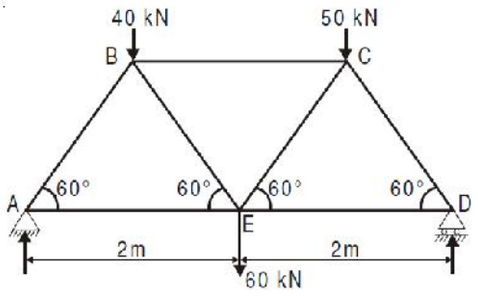
OR

3.	Two spheres, each of weight 1000 N and of radius 25 cm rest in a horizontal channel of width 90 cm as shown in Fig. Find the reactions on the points of contact A, B and C.	12M	1	3



UNIT–II

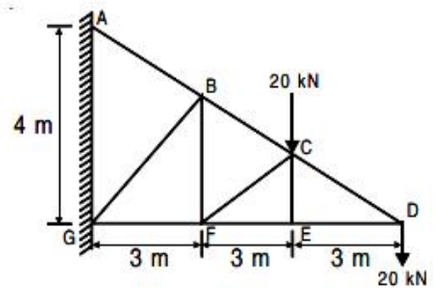
4. Determine the forces in all the memers of the truss shown in Fig. and indicate the magnitude and nature of forces on the diagram of the truss. All inclined members are at 60° to horizontal and length of each member is 2 m.



12M 2 3

OR

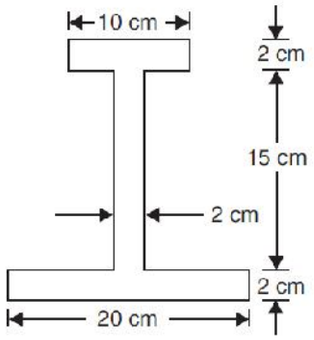
5. Determine the forces in all the members of the truss shown in figure. Indicate the nature of forces using the convention tension as positive and compression as negative.



12M 2 3

UNIT–III

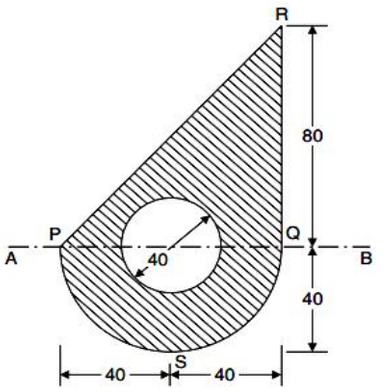
6. Find the centre of gravity of the I-section shown in Fig.



12M 3 3

OR

7. Find the moment of inertia of the shaded area shown in figure about the axis AB.



12M 3 3

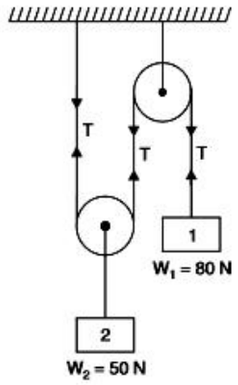
UNIT–IV

8. A particle moves along a straight line so that its displacement is metre from a fixed point is given by, $S=2t^3+4t^2-6t+8$ Find : (*i*) velocity at start, (*ii*) velocity after 5 seconds, (*iii*) acceleration at start and (*iv*) acceleration after 5 seconds. 12M 4 3

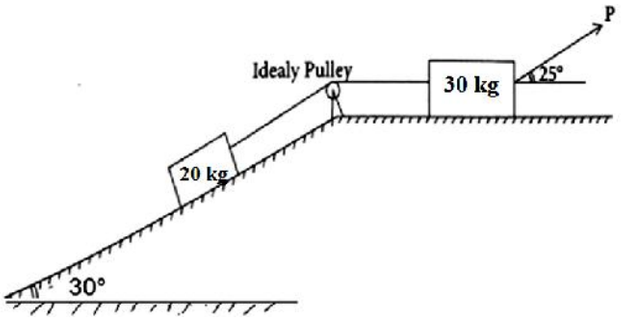
OR

9.	Two trains A and B leave the same station on parallel lines. A start with a uniform acceleration of 0.17 m/s^2 and attains a speed of 24 km/hr, when stream is reduced to keep the speed constant. B leaves 40 seconds after, with uniform acceleration of 0.3 m/s^2 to attain a maximum speed of 48 km/hr. When it will overtake A?	12M	4	3

UNIT–V

10.	A system of frictionless pulleys carries two weights hung by inextensible cords as shown in figure. Find (i) The acceleration of the weights and tension in the cords (ii) The velocity and displacement of weight '1' after 5 seconds from start if the system is released by rest. 	12M	5	3

OR

11.	Two masses of 30 kg and 20 kg are connected by an inextensible string passing over an ideal pulley as shown in figure. If the coefficient of friction between all contact surfaces is 0.16 then determine the pull required on block 30 kg to attain a velocity of 9.6 m/s during 6 second. Also determine the tension in the string. 	12M	5	3

*** End ***

Hall Ticket Number :										

R-20

Code: 20AC24T

I B.Tech. II Semester Regular Examinations October 2021

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)

			CO	Blooms Level
1.	**Answer ALL the following short answer questions**	(5 X 2 = 10M)		
	a)	Define center of mass of a body.	CO1	L1
	b)	Why inverse piezo-electric method is used to produce ultrasonics?	CO2	L3
	c)	Classify magnetic materials based on their properties.	CO3	L4
	d)	Explain the principle of an optical fiber.	CO4	L2
	e)	Mention the applications of a sensor.	CO5	L1

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

			Marks	CO	Blooms Level
		UNIT–I			
2.	a)	Obtain relation between torque and angular momentum.	5M	CO1	L2
	b)	Discuss Newton's laws in inertial and non-inertial frames of reference.	7M	CO1	L2
		OR			
3.	a)	Write the significance of a divergence and curl of a vector field.	5M	CO1	L1
	b)	Explain qualitatively about Foucault's pendulum.	7M	CO1	L2
		UNIT–II			
4.	a)	What are the factors that affect acoustics of buildings?	6M	CO2	L1
	b)	Suggest the remedies to build acoustically a good hall.	6M	CO2	L5
		OR			
5.	a)	Discuss Nondestructive testing methods to test samples by ultrasonics	7M	CO2	L2
	b)	List the applications of ultrasonics.	5M	CO2	L1
		UNIT–III			
6.	a)	Deduce Claussius-Mosotti relation in dielectrics.	7M	CO3	L3
	b)	Write a short notes on electronic polarization.	5M	CO3	L1
		OR			
7.	a)	Explain the origin of magnetic moments of magnetic materials.	7M	CO3	L2
	b)	Mention the applications of magnetic device applications	5M	CO3	L1
		UNIT–IV			
8.	a)	Describe the construction and working of He-Ne laser.	9M	CO4	L2
	b)	Write industrial and medical applications of laser.	3M	CO4	L1
		OR			
9.	a)	Discuss various types of optical fibers based on modes.	7M	CO4	L2
	b)	Briefly explain the losses of an optical fiber.	5M	CO4	L2
		UNIT–V			
10.	a)	What are the various types of sensors?	6M	CO5	L1
	b)	List the applications of sensors.	6M	CO5	L1
		OR			
11.	a)	Explain bimetallic strip based temperature sensor.	6M	CO5	L1
	b)	Write a note on Hall effect sensor.	6M	CO5	L1

*** End ***