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

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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**

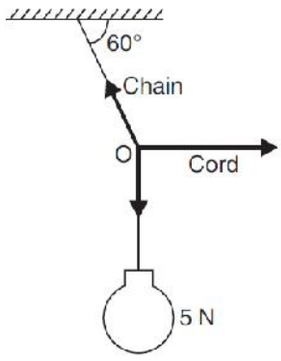
PART-A
(Compulsory question)

		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

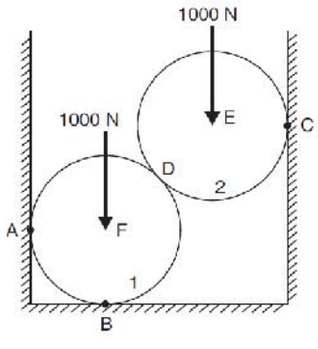
Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		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



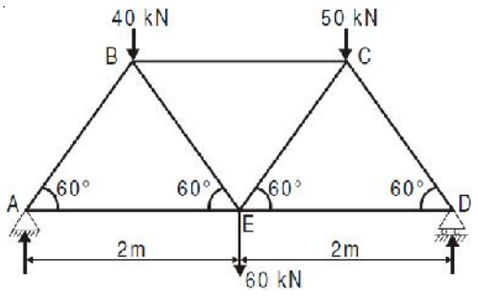
OR

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

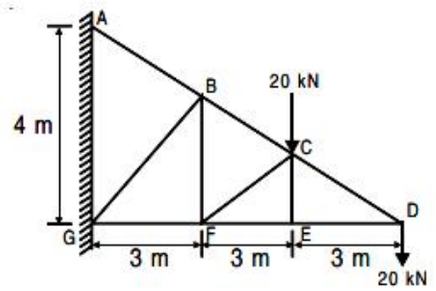
4. Determine the forces in all the memers of the truss shown in Fig. and indicate the magnitude and nature of forces on the diagram of the truss. All inclined members are at 60° to horizontal and length of each member is 2 m.



12M 2 3

OR

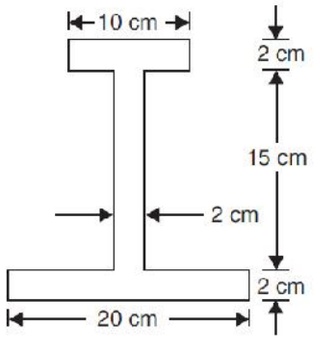
5. Determine the forces in all the members of the truss shown in figure. Indicate the nature of forces using the convention tension as positive and compression as negative.



12M 2 3

UNIT–III

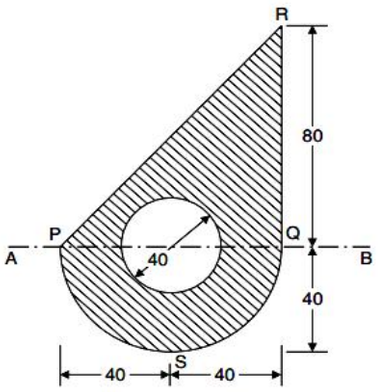
6. Find the centre of gravity of the I-section shown in Fig.



12M 3 3

OR

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



12M 3 3

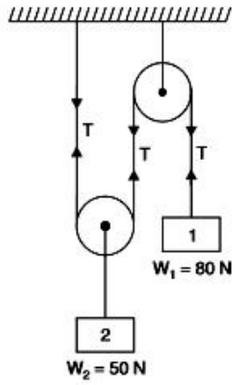
UNIT–IV

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

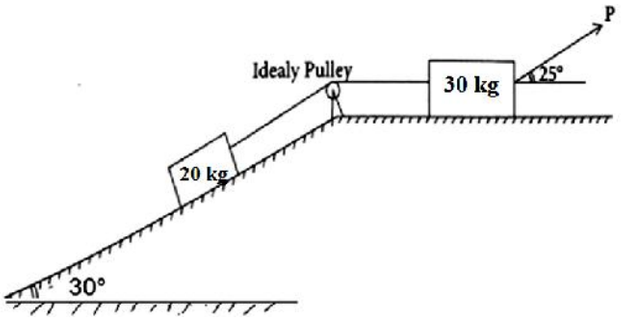
OR

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

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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 ***

Hall Ticket Number :										

R-20

Code: 20A223T

I B.Tech. II Semester Regular Examinations October 2021

Basic Electrical and Electronics Engineering

(Common to CE, CSE and AI & DS)

Max. Marks: 70 Time: 3 Hours

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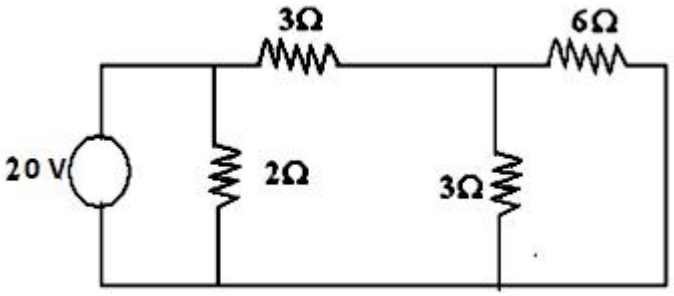
Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A
(Compulsory question)

		CO	Blooms Level
1.	**Answer ALL the following short answer questions** (5 X 2 = 10M)		
a)	Explain the relationships of R, L and C elements?	CO1	L1
b)	What is the significance of back e.m.f?	CO2	L1
c)	What is meant by slip of an induction motor?	CO3	L1
d)	Draw the circuit symbol for a PNP and NPN transistors	CO4	L1
e)	What are the main components of a CRT?	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)	Classify Network elements and give their volt-ampere relations.	6M	CO1	L1
	b)	A circuit consists of 2 Ω, 4 Ω, 10 Ω and 20 Ω resistors connected in parallel. A total current of 10 A flows into the circuit supplied voltage is 30V, determine total resistance and current in each resistor.	6M	CO1	L3
		OR			
3.	a)	State and explain Kirchhoff's current law with suitable examples.	6M	CO1	L1
	b)	Determine the current through 6Ω resistor and the power supplied by the for the circuit shown in figure			



			6M	CO1	L3
		UNIT–II			
4.	a)	Mention the applications of DC shunt and series motors?	6M	CO2	L1
	b)	A 6 pole wave wound dc generator is having 50 slots with 25 conductors per slot and rotating at 1500 rpm. The flux per pole is 0.015 wb, calculate the emf generated?	6M	CO2	L3
		OR			

5.	a)	Derive an expression for the torque of a dc motor.	6M	CO2	L2
	b)	A 230 V motor has an armature circuit resistance of 0.6 ohm. If the full-loaded armature current is 30A and no load armature current is 4A, find the change in back e.m.f. from no load to full load.	6M	CO2	L3

UNIT–III

6.	a)	Explain how to determine the regulation of alternator by synchronous impedance method	6M	CO3	L1
	b)	Explain the Principle operation of Transformer?	6M	CO3	L3

OR

7.	a)	Explain the principle of operation of 3-phase induction motor with neat sketch?	6M	CO3	L1
	b)	A 230/400 V single phase transformer has 800 turns on primary. The maximum flux density in the core is 1.5 Wb/m^2. Calculate the number of turns on secondary, area of cross section and maximum flux in the core.	6M	CO3	L3

UNIT–IV

8.	a)	Explain with a neat diagram working of bridge wave rectifier?	6M	CO4	L2
	b)	Explain the operation of PNP transistor and draw its characteristics.	6M	CO4	L1

OR

9.	a)	Explain the working of a P-N Diode in forward bias and reverse bias?	6M	CO4	L1
	b)	Draw the circuit diagram of full wave rectifier and explain its operation	6M	CO4	L1

UNIT–V

10.	a)	Explain the principle of operation of the Cathode ray tube?	6M	CO5	L1
	b)	Write the applications of the CRO?	6M	CO5	L1

OR

11.	a)	What is the earthing? What is the purpose of earthing?	6M	CO5	L1
	b)	Discuss about the types of wires?	6M	CO5	L1

*** End ***

Hall Ticket Number :										

R-20

Code: 20A326T

I B.Tech. II Semester Regular Examinations October 2021

Basic Mechanical Engineering

(Civil Engineering)

Max. Marks: 70 Time: 3 Hours

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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 are the characteristics features of filler metals and fluxes?	1	L1
	b)	What are the stages of casting process?	2	L1
	c)	Define compression ratio and cubic capacity of the engine.	3	L1
	d)	Define ton of refrigeration and COP.	4	L1
	e)	Compare the belt drive and gear drive.	5	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)	Enumerate with neat sketches three types of flames used in gas welding.	6M	1	L2
	b)	Describe the oxy-acetylene gas welding technique and give the applications.	6M	1	L2
		OR			
3.	a)	Describe with neat sketches the TIG welding method and give its specific applications.	6M	1	L2
	b)	Describe the soldering and brazing process with its applications	6M	1	L2
		UNIT–II			
4.	a)	Draw the lathe machine and list the various components on it. Describe the process various operations performed on a lathe.	6M	2	L2
	b)	Give an illustrative explanation of Rolling process, and explain its working principle.	6M	2	L2
		OR			
5.	a)	Explain the milling process with neat diagram and also discuss the working principle.	6M	2	L2
	b)	Explain the Extrusion process with neat diagram and also discuss the working principle.	6M	2	L2
		UNIT–III			
6.	a)	What are the differences between Two stroke engine and Four stroke Engine?	6M	3	L2
	b)	Explain the working of 4 stroke diesel engine.	6M	3	L2
		OR			
7.	a)	What is the function of a compressor? And explain the working principle of Reciprocating type air compressor.	6M	3	L2
	b)	Explain the working of 2 stroke diesel engine.	6M	3	L2
		UNIT–IV			
8.	a)	Explain the Vapour absorption refrigeration system with suitable diagrams.	8M	4	L2
	b)	Discuss the basic laws of thermodynamics.	4M	4	L2
		OR			
9.	a)	What is ventilation? How does it affect the comfort air conditions?	6M	4	L2
	b)	Discuss the basic laws of heat transfer.	6M	4	L2
		UNIT–V			
10.	a)	Discuss the various types of drives used for the transmission of power.	6M	5	L2
	b)	Write the advantages and Disadvantages of chain drive over belt and rope drive.	6M	5	L2
		OR			
11.	a)	Discuss the about Earth moving machines.	6M	5	L2
	b)	Compare cross belt drive and open belt drive on the basis of: (i) Velocity ratio. (ii) Direction of driven pulley. (iii) Length of belt drives (iv) Application.	6M	5	L2

*** End ***

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

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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 ***