Hall Ticket Number :

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

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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 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) 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 $(D - 2)^2 y = 8[e^{2x} + \sin 2x + x^2]$ 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 $\frac{EC}{2}\{\sin\frac{t}{\sqrt{LC}} - \frac{t}{\sqrt{LC}}\cos\frac{t}{\sqrt{LC}}\}$ 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 $f = x^2 - y^2 + 2z^2$ 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. $(x^2 - yz)\bar{\imath} + (y^2 - zx)\bar{\jmath} + (z^2 - xy)\bar{k}$

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 $\int_c (y - sinx)dx + cosdy$ where C is the plane triangle enclosed by the lines

$y = 0, x = \dfrac{\pi}{2}$ and $y = \dfrac{2x}{\pi}$

12M 5 3

OR

11. Apply stokes theorem to evaluate $\int_c (ydx + zdy + xdz)$ where C is the curve of intersection of $x^2 + y^2 + z^2 = a^2$ and $x + z = a$

12M 5 3

*** End ***

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

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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 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.

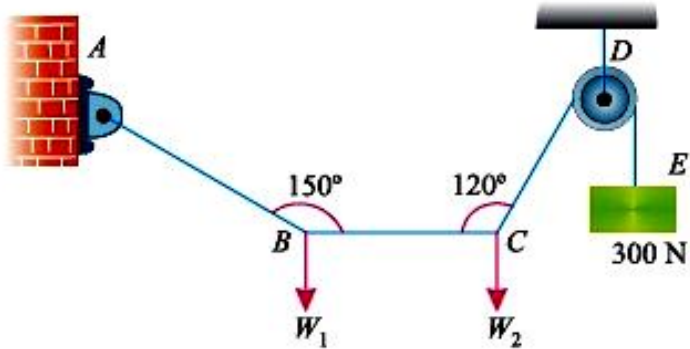**Fig.1**   12M   1   3

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.
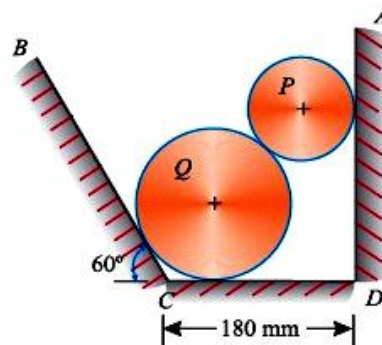

Fig.2   8M   1   3

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.
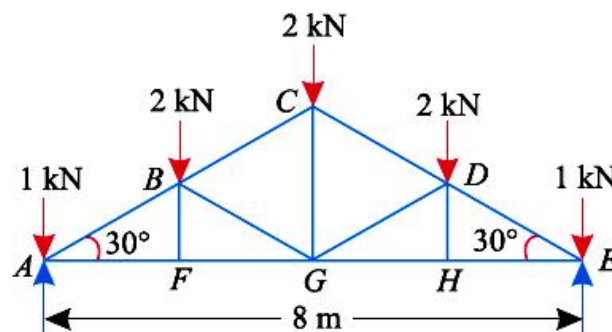
Fig.3   12M   2   3

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
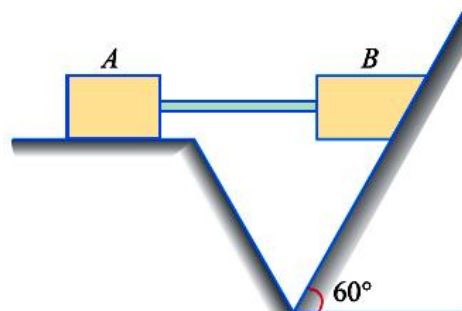
   b) Find the centroid of an unequal angle section 100 mm × 80 mm × 20 mm as shown in Fig. 5.
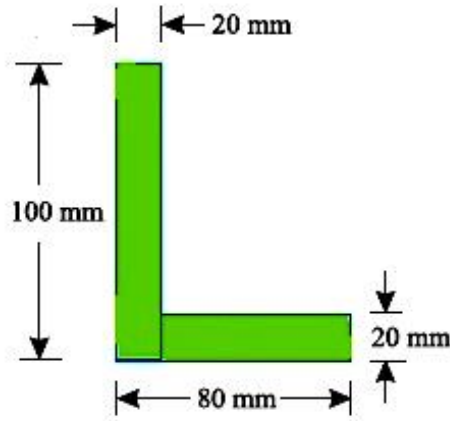
Fig.5   7M 3 3

OR

7. Determine I_{xx} and I_{yy} of the cross-section of a cast iron beam as shown in Fig.6.
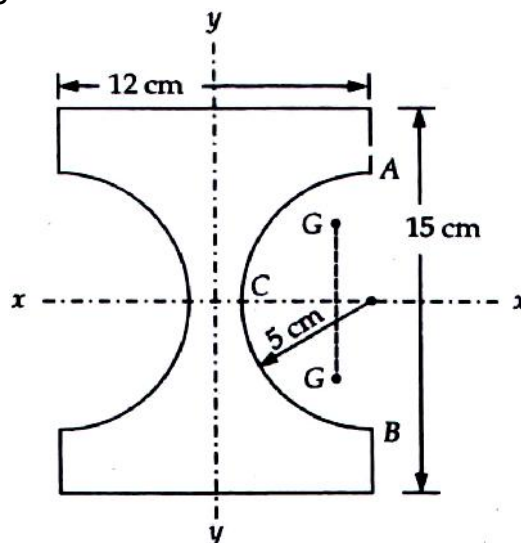
Fig.6   12M 3 3

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 ***

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

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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 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)	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

			Marks	CO	BL
2.	a)	Explain Inertial and Non-Inertial Frames of reference	8M	CO1	L2
	b)	Discuss about Conservative Force.	4M	CO1	L3

OR

			Marks	CO	BL
3.	a)	Outline Kepler's Laws qualitatively.	6M	CO1	L2
	b)	Derive F=-grad V.	6M	CO1	L3

UNIT–II

			Marks	CO	BL
4.	a)	What is Reverberation and Reverberation time	4M	CO2	L2
	b)	Summarize the factors affecting Acoustics and their remedies	8M	CO2	L2

OR

			Marks	CO	BL
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

			Marks	CO	BL
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 ***

R-20

Code: **20A223T**

I B.Tech. II Semester Supplementary Examinations December 2023

Basic Electrical and Electronics Engineering

(Common to CE, CSE, AI&DS, CSE(AI) and CSE(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 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) State and explain Kirchhoff's Current Law.   1   1

   b) What is the significance of back emf?   2   2

   c) Define regulation and efficiency of a transformer.   3   1

   d) What is a PN Junction diode and how this is to be operated.   4   2

   e) What are the essential components of indicating instrument?   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. a) Two batteries A and B with the internal resistances R_A and R_B are connected in parallel to supply current of 155A to a load resistance R_L. Given E_A=122V, R_A=0.15 ohms and R_B=0.1ohms and I_B = 60A. Calculate E_B and power drawn by the load?   6M   1   3

   b) A 35V d.c supply is connected across a resistance of 600ohms in series with an unknown resistance R. A voltmeter having a resistance 1200 ohms is connected across 600 ohms and shows a reading of 5V. Calculate the value of resistance R.   6M   1   3

OR

3. a) Define the following terms with an example:

   (i) Unilateral elements (ii) Distributed elements (iii) Linear elements (iv) active elements   6M   1   1

   b) A circuit consists of three resistances of 12, 18 and 36 ohms respectively by joined in parallel and the combination is connected in series with a resistance of 12 ohms. The whole circuit is connected to 60V supply. Calculate current in each branch, total current drawn and power dissipated in each resistor.   6M   1   3

UNIT–II

4. a) Explain in detail about the classification of DC generators based on the type of excitation? Give the connection diagrams.   6M   2   2

b) A 4 pole 220V wave connected shunt motor gives 11.19 kW when running at 1000 r.p.m and drawing armature and field current of 50A and 1A respectively. It has 540 conductors. Its resistance is 0.1 ohms. The brush drop is 1V per brush. Calculate total torque, useful torque, flux per pole, rotational losses and efficiency?   6M   2   3

<div align="center">OR</div>

5. a) What is the operating principle of a DC motor? Explain in detail   6M   2   2

b) A long shunt compound generator delivers a load current of 30A at 400V and has armature, series field and shunt field resistances of 0.04 ohms, 0.02 ohms and 180 ohms respectively. Calculate the generated voltage and the armature current. Allow 1V per brush for contact drop   6M   2   3

<div align="center">**UNIT–III**</div>

6. a) Explain the transformer on no-load with phasor diagram.   6M   3   4

b) A single phase core type 50Hz transformer has a square having 25cm side, the maximum flux density in the core 1.2 wb/m2 .Calculate the number of turns per limb on H.V. side and L.V side for a 3400V/240V ratio.   6M   3   3

<div align="center">OR</div>

7. a) Draw and explain the torque-slip characteristics of three-phase induction motor   6M   3   4

b) A 3-phase star connected alternator has 8-poles and runs at 750rpm. It has 24 slots/phase and 10 conductors per slot, the flux being 0.055 Wb/pole. Calculate the line voltage. Assume winding factor to be 0.96.   6M   3   3

<div align="center">**UNIT–IV**</div>

8. a) Explain about the operation of a transistor as amplifier with a neat of circuit diagram?   6M   4   3

b) Draw and explain the circuit diagram of a common emitter amplifier and draw its charcteristics?   6M   4   2

<div align="center">OR</div>

9. a) For a transistor connected in common-emitter configuration, sketch the output characteristics relating collector current and the collector emitter voltage, for various values of base current. Explain the shape of the characteristics.   6M   4   3

b) Justify the answer the transistor acts as an amplifier?   6M   4   4

<div align="center">**UNIT–V**</div>

10.   Explain How frequency is measured by using CRO.   12M   5   2

<div align="center">OR</div>

11.   Classify the cables and explain in details any of two of them.   12M   5   2

<div align="center">*** End ***</div>

Code: 20A326T

I B.Tech. II Semester Supplementary Examinations December 2023

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 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)		CO	BL
a)	What are the basic metal joining processes?		CO1	L1,L2
b)	What is meant by casting process?		CO2	L1,L2
c)	What are the main components of an IC engine?		CO3	L1,L2
d)	What is meant by Conduction?		CO4	L1,L2
e)	How belt drives are used for power transmission?		CO5	L1,L2

PART-B

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

		Marks	CO	BL
	UNIT–I			
2.	Discuss the process of Oxy-acetylene welding with the help of a neat sketch.	12M	CO1	L1,L2
	OR			
3.	What is meant by arc welding? Explain any one type of arc welding.	12M	CO1	L1,L2
	UNIT–II			
4.	Explain anyone type of manufacturing process with a suitable application.	12M	CO2	L1,L2
	OR			
5.	Explain the operation of Drilling with a neat sketch.	12M	CO2	L1,L2
	UNIT–III			
6.	State and explain the working principle of two-stroke engines.	12M	CO3	L1,L2
	OR			
7.	Explain the working of an Air compressor with a neat sketch.	12M	CO3	L1,L2
	UNIT–IV			
8.	Explain with the help of a neat sketch the working of a Vapour compression refrigerator test rig.	12M	CO4	L1,L2
	OR			
9.	Discuss the different types of Ventilation systems.	12M	CO4	L1,L2
	UNIT–V			
10.	Explain as how power transmission takes place by a rope drive with a suitable example.	12M	CO5	L1,L2
	OR			
11.	Explain the working of a bull dozer with a neat sketch.	12M	CO5	L1,L2

*** End ***