R-20

**Code: 20AC21T**

I B.Tech. II Semester Supplementary Examinations March 2022

## 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) | Find the particular integral of the equation $\dfrac{dy}{dt} + y = e^{2t} + t$ . | CO1 | L2 |
| b) | Solve the Euler's equation $x^2 \dfrac{d^2 y}{dx^2} > x \dfrac{dy}{dx} > 8y \mathbb{N} 0$ . | CO2 | L3 |
| c) | Form a partial differential equation by eliminating $f$ , from $f(\text{xy}+ z^2, x+ y+ z) = 0$ | CO3 | L2 |
| d) | Find *div curl* $\vec{F}$ where $\vec{F} = x^2 y \vec{i} + xz\, \vec{j} + 2yz\vec{k}$ . | CO4 | L3 |
| e) | State Gauss's divergence 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 $(D-2)^2 y = x^2 \sin x + e^{2x} + 3.$ | 12M | CO1 | |

**OR**

| | | | | |
|---|---|---|---|---|
| 3. | Solve the following equation by the method of variation of parameters $(D^2 - 2D) y = e^x \sin x.$ | 12M | CO1 | |

### UNIT–II

| | | | | |
|---|---|---|---|---|
| 4. | Solve $(x^2 D^2 + xD + 1) y = \log x \sin(\log x).$ | 12M | CO2 | |

**OR**

| | | | | |
|---|---|---|---|---|
| 5. | Solve $D^2 x + y = \sin t$ ; $x + D^2 y = \cos t$ . | 12M | CO2 | |

### UNIT–III

| | | | | |
|---|---|---|---|---|
| 6. a) | Solve $x^2 p^2 + y^2 q^2 = z^2$ | 6M | CO3 | |

b) Solve $(mz - ny)p + (nx - lz)q = ly - mx$     6M   CO3

**OR**

7. Solve by the method of separation of variables

$$2xz_x - 3yz_y = 0$$
    12M   CO3

**UNIT–IV**

8. Find the directional derivative of

$$W(x, y, z) = x^2 yz + 4xz^2$$

at (1, -2, -1) in the direction of $2\vec{i} - \vec{j} - 2\vec{k}$.     12M   CO4

**OR**

9. a) Show that the vector field given by

$$\vec{A} = 3x^2 y\vec{i} + (x^3 - 2yz^2)\vec{j} + (3z^2 - 2y^2 z)\vec{k}$$ is

irrotational but not solenoidal. Also find its scalar potential

$W(x, y, z)$     12M   CO4

**UNIT–V**

10. Verify Green's theorem for the scalar line integral of

$$\vec{F} = (x^2 + y^2)\vec{i} - 2xy\vec{j}$$ around the rectangle

formed by the lines $x = \pm a, y = b.$     12M   CO5

**OR**

11. Evaluate $\iint_s \vec{F}.\vec{n}dS$ where

$$\vec{F} = (x + y^2)\vec{i} - (2x)\vec{j} + 2yz\vec{k}$$ and S is the surface of

the plane $2x + y + 2z = 6$ in the first octant     12M   CO5

*** End ***

**Code: 20A323T**

I B.Tech. II Semester Supplementary Examinations March 2022

**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**

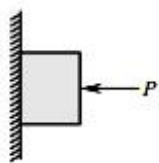**(Compulsory question)**

**1. Answer ALL the following short answer questions**     ( 5 X 2 = 10M )    CO    Blooms Level

a) A 50 N force is to be resolved into components along line a-a' and b-b' as shown in the figure. If the component along b-b' is 30 N determine angle

.
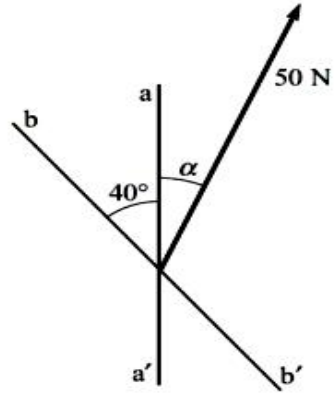


                                                                                                       1         2

b) A block of 250 N weight must be held against a wall as shown in figure by applying a force P normal to the contact surface. If the coefficient of friction between the surfaces is 0.3, determine the minimum force required.



                                                                                                       2         2

c) Define pappus theorems.                                         3         2

d) Establish the relationships between angular motion and linear motion.       4         1

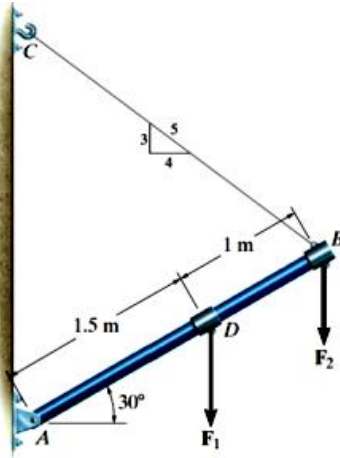e) Enunciate the work energy principle.                                 5         1
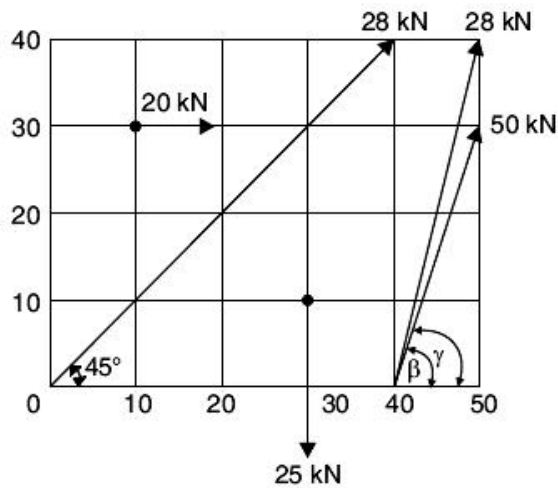
| UNIT–I |
|---|

2. A boom supports two vertical loads F1 and F2 and is supported as shown in the figure. The cable CB can sustain a maximum load of 1500 N before it fails. Calculate the critical loads if $F_1 = 2F_2$ and the magnitude of the reaction at pin A.
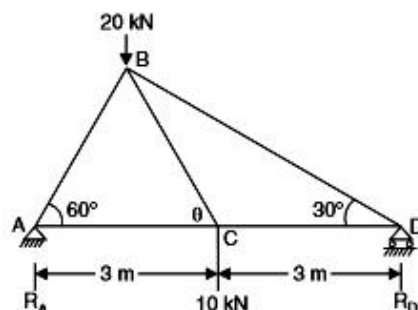


12M   1   3

**OR**

3. Find the resultant of the system of forces shown in Figure.



12M   1   3
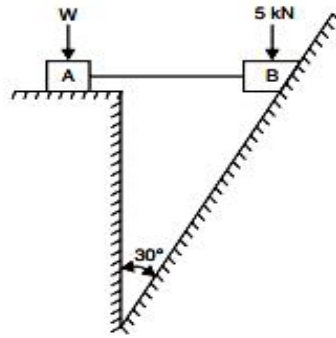
| UNIT–II |
|---|

4. Determine the forces in the members AB, AC and BD of the truss shown in figure.



12M   2   3

**OR**

5. Two blocks which are connected by a horizontal link AB are supported on two rough planes as shown in figure. The coefficient of friction of block A is 0.4. The angle of friction for the block B on the inclined plane is Ø = 20°. Find the smallest weight W of the block A for which equilibrium can exist.



12M    2     3

**UNIT–III**

6. Find the moment of inertia about X-X and Y-Y axes as shown in figure.
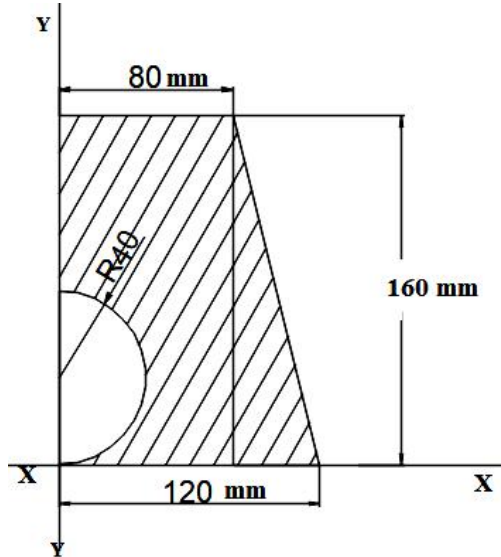


12M    3     3

**Code: 20A323T**

**OR**

7. Find the centre of gravity of the given section shown in figure.
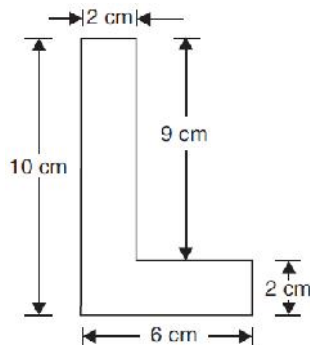


12M   3    3

**UNIT–IV**

8. A soldier fires a bullet with a velocity of 31.32 m/sec at an angle of   upwards from the horizontal from his position on a hill to strike a target which is 100 m away and 50 m below his position. Find the angle of projection  . Find also the velocity with which the bullet strikes the object.

12M   4    3

9. A train starting from rest, acceleration uniformly for 2 minutes, run at constant speed for 4 minutes. After this the train comes to stop with uniform retardation for 3 minutes and this covers a distance of 5 km. find (a) its constant speed, (b) its acceleration, and (c) its retardation. 12M 4 3

UNIT–V

10. Determine the constant force P that will give the system of bodies as shown in figure, a velocity of 3 m/sec after moving a distance of 4.5 m from the position of rest. Coefficient of friction at all contact points is 0.2. Assume pulley is frictionless.
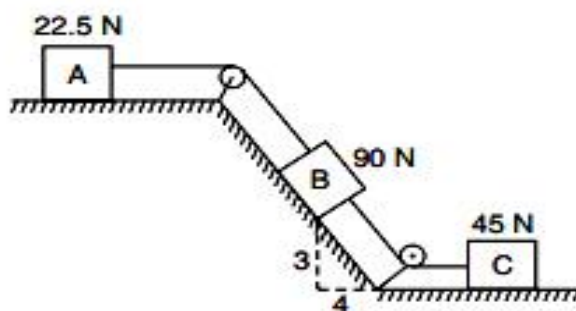


12M 5 3

OR

11. Two blocks 40 kg and 24 kg are connected by inextensible strings and supported as shown in figure. Determine tension in the string and time taken by block 24 kg to attain a velocity of 2 m/sec from rest. Consider pulley as frictionless and weightless. Take coefficient of friction between block 40 kg and plane as 0.25.



12M 5 3

*** End ***
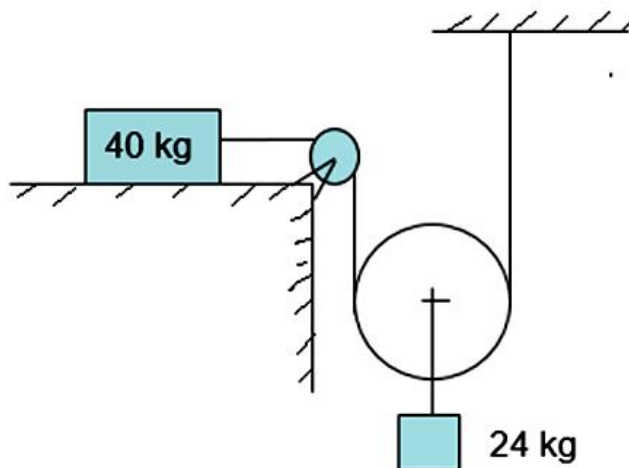
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I B.Tech. II Semester Supplementary Examinations March 2022
## Engineering Physics
( Common to CE & ME )

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 )

1.**Answer ALL the following short answer questions**      ( 5 X 2 = 10M )

| | | CO | Blooms Level |
|---|---|---|---|
| a) | Distinguish between torque and angular momentum. | CO1 | L4 |
| b) | Write any two causes of time of reverberation. | CO2 | L1 |
| c) | Define dielectric polarization. | CO3 | L1 |
| d) | Why LASER is high intense than ordinary light? | CO4 | L3 |
| e) | Mention various types of sensors. | 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) | Discuss Newton's laws in inertial and non-inertial frames of reference. | 7M | CO1 | L2 |
| | b) | Why center of mass has shown its importance? | 5M | CO1 | L3 |
| | | **OR** | | | |
| 3. | a) | Write the significance of a divergence and curl of a vector field. | 6M | CO1 | L1 |
| | b) | Qualitatively discuss Kepler's gravitational laws. | 6M | CO1 | L2 |
| | | **UNIT–II** | | | |
| 4. | a) | Deduce Sabine's formula for time of reverberation using growth. | 7M | CO2 | L3 |
| | b) | Calculate time of reverberation using decay method. | 5M | CO2 | L3 |
| | | **OR** | | | |
| 5. | a) | Define magnetostriction in ultrasonics. | 3M | CO2 | L1 |
| | b) | Discuss production of ultrasonics by magnetostriction method. | 9M | CO2 | L2 |
| | | **UNIT–III** | | | |
| 6. | a) | Explain various types of polarizations in dielectrics. | 7M | CO3 | L2 |
| | b) | Mention the applications of dielectrics. | 5M | CO3 | L1 |
| | | **OR** | | | |
| 7. | a) | Distinguish between hard and soft magnetic materials | 7M | CO3 | L4 |
| | b) | List the applications of magnetic device applications | 5M | CO3 | L1 |
| | | **UNIT–IV** | | | |
| 8. | a) | What are the characteristics of a laser? | 3M | CO4 | L1 |
| | b) | Describe the construction and working of Ruby laser. | 9M | CO4 | L2 |
| | | **OR** | | | |
| 9. | a) | Derive an expression for numerical aperture of an optical fiber. | 9M | CO4 | L4 |
| | b) | An optical fiber has a refractive index of core 1.55 and cladding 1.50. Find its numerical aperture. | 3M | CO4 | L4 |
| | | **UNIT–V** | | | |
| 10. | a) | Discuss about strain and pressure sensors. | 7M | CO5 | L2 |
| | b) | What are their applications? | 5M | CO5 | L1 |
| | | **OR** | | | |
| 11. | a) | How a piezoelectric sensor works? | 5M | CO5 | L1 |
| | b) | Write a short note on pyroelectric detector. | 7M | CO5 | L1 |

\*\*\* End \*\*\*

**R-20**

Code: 20A223T

I B.Tech. II Semester Supplementary Examinations March 2022
**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)

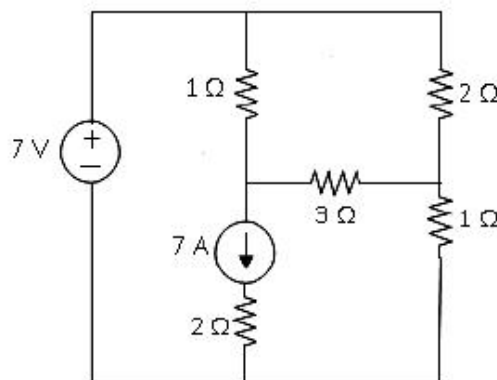| | | CO | Blooms Level |
|---|---|---|---|
| 1. | **Answer ALL the following short answer questions** ( 5 X 2 = 10M ) | | |
| | a) How the voltage is divided in a series circuit? | CO1 | L2 |
| | b) State the function of commutator in D.C. Generator? | CO2 | L1 |
| | c) Mention the various losses occur in single phase transformer? | CO3 | L1 |
| | d) What do you understand by Depletion region in a diode | CO4 | L1 |
| | e) What is meant by MCB | CO5 | LI |

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

| | | Marks | CO | Blooms Level |
|---|---|---|---|---|

### UNIT–I

| | | | Marks | CO | Blooms Level |
|---|---|---|---|---|---|
| 2. | a) | Explain the concept of series and parallel circuits | 6M | CO1 | L2 |
| | b) | Determine the current in 3 resistor and voltage across the current source in the network shown in figure using mesh analysis. | | | |



| | | | 6M | CO1 | L3 |
|---|---|---|---|---|---|

**OR**

| | | | Marks | CO | Blooms Level |
|---|---|---|---|---|---|
| 3. | a) | State and explain the Faraday's law of electromagnetic induction? | 6M | CO1 | L1 |
| | b) | A resistance of R ohms is connected in series with parallel circuit comprising of two resistors of 12 ohms and 28 ohms respectively. The total power dissipated in the circuit is 70 W when the applied voltage is 20V. Calculate the value of R? | 6M | CO1 | L3 |

## UNIT–II

4. a) From the fundamentals, derive the EMF equation of DC generator. 6M CO2 L2

   b) What are the different types of DC motors? Explain with neat connection diagrams. 6M CO2 L2

**OR**

5. a) How the back emf is generated in a DC motor? What is the significance of back emf? 6M CO2 L1

   b) A 6-pole lap wound DC generator has 600 conductors on its armature. Flux per pole is 0.02 Wb, speed is 1500rpm. Calculate EMF generated. Also calculate EMF generated if the generator is wave wounded. 6M CO2 L3

## UNIT–III

6. a) Explain the principle of operation of 3-phase induction motor with neat sketch? 6M CO3 L1

   b) A single phase transformer has 400 primary and 1000 secondary turns. The net cross sectional area of the core is 60 cm$^2$. If the primary winding is connected to a 50 Hz supply at 520V, Calculate (i) Peak value of flux density in the core (ii) Voltage induced in the secondary winding (iii) Transformation ratio? 6M CO3 L3

**OR**

7. a) State the Principle of operation of single phase transformer? Derive and expression for EMF induced in transformer? 6M CO3 L2

   b) The Power to an induction motor is supplied by a 12 pole, 3-phase, 500 rpm alternator. The full load speed of the motor is 1440rpm. Find the percentage slip and number of poles in the motor. 6M CO3 L3

## UNIT–IV

8. a) Discuss the different types of rectifiers with neat sketches? 6M CO4 L1

   b) List the different applications of the Diode 6M CO4 L1

**OR**

9. a) Explain the operation of half wave diode rectifier with a neat diagram. 6M CO4 L2

   b) Explain how a P-N unction diode acts as a rectifier. 6M CO4 L1

## UNIT–V

10. a) Draw the sketch of a Function Generator and explain its working 6M CO5 L2

    b) Briefly explain the classification of instruments 6M CO5 L1

**OR**

11. Discuss how to measure the voltage, current and frequency with CRO? 12M CO5 L2

*** End ***

Hall Ticket Number :

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|

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 | Blooms Level |
|---|---|---|---|
| a) | Write the advantages of soldering. | 1 | L1 |
| b) | What are the properties of moulding sand? | 2 | L1 |
| c) | Why multi stage compression is required. Write the application of air compressors. | 3 | L1 |
| d) | What is the difference between refrigeration and air conditioning system? | 4 | L1 |
| e) | Write the advantages and Disadvantages of chain drive over belt and rope 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) | Explain the process of submerged arc welding with neat sketch. What are its advantages? | 6M | 1 | L2 |
| | b) | Differentiate arc welding and submerged arc welding. | 6M | 1 | L2 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 3. | a) | Explain in detail about the TIG and MIG welding processes. | 6M | 1 | L2 |
| | b) | Describe the brazing process with neat sketches. | 6M | 1 | |

### UNIT–II

| | | | | | |
|---|---|---|---|---|---|
| 4. | a) | Draw a neat diagram of grinding process, and explain its working principle. | 6M | 2 | L2 |
| | b) | Give an illustrative explanation on casting process? Summarize the factors influencing the quality of finished casting. | 6M | 2 | L2 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 5. | a) | Compare and contrast between Drilling and Milling operations. | 6M | 2 | L2 |

b) Give a comprehensive explanation of forging process. What are its limitations? Mention some of its applications. 6M 2 L2

## UNIT–III

6. a) Explain the basic components and nomenclature of an IC engine with a neat sketch. 6M 3 L2

b) Explain the working of 4 stoke SI Engine. 6M 3 L2

**OR**

7. a) Classify air compressors and explain the working principle of multi stage compressor. 6M 3 L2

b) Explain the working of 2 stroke SI Engine. 6M 3 L2

## UNIT–IV

8. a) Explain the Vapour compression refrigeration system with suitable diagrams. 8M 4 L2

b) What is the difference between refrigerator and heat pump? 4M 4 L2

**OR**

9. a) What is Comfort air conditioning systems? What are the factors which affects the Comfort air conditioning systems? 6M 4 L2

b) Classify room air conditioning systems. Explain any one of the systems with neat diagram. 6M 4 L2

## UNIT–V

10. a) Define slip and creep in the belt. 4M 5 L1

b) A shaft runs at 80 rpm & drives another shaft at 150 rpm through belt drive. The diameter of the driving pulley is 600mm. Determine the diameter of the driven pulley in the following cases: (i) Taking belt thickness as 5 mm. (ii) Assuming for belt thickness 5 mm and total slip of 4%. 8M 5 L3

**OR**

11. a) Write the advantages of V-belts over flat belt drive. 6M 5 L2

b) Discuss the about mechanical handling equipment. 6M 5 L2

*** End ***