Hall Ticket Number :

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

**Code: 20A322T**

I B.Tech. II Semester Supplementary Examinations June 2024
# Engineering Graphics & Design
(Mechanical Engineering)

Max. Marks: 70                                                                 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks )
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|  |  | Marks | CO | BL |
|---|---|---|---|---|

**UNIT–I**

1. a) Draw the projections of a cone of base 30mm diameter and axis 50mm long, when it is resting on HP on its base — 7M CO1 L3

   b) Draw the projections of a cylinder of base 30mm diameter and axis 50mm long, when it is resting on HP on its base — 7M CO1 L3

**OR**

2. Draw the projections of a right circular cylinder diameter of base 30mm and height 60mm resting on HP on its base, such that the axis is parallel to VP and inclined at $30^0$ to HP — 14M CO1 L3

**UNIT–II**

3. A cylinder of base diameter 50mm and axis 70mm long is lying on the HP on one of its base. It is cut by a horizontal section plane. The section plane intersects the axis of the cylinder at a height of 40mm from the base. Draw the sectional front view and sectional top view — 14M CO2 L3

**OR**

4. A hexagonal pyramid, base 30mm side and axis 65mm long, is resting on its base on the H.P. with two edges parallel to the V.P. It is cut by a section plane, perpendicular to the V.P. inclined at $45^0$ to the H.P. and intersecting the axis at a point 25mm above the base. Draw the front view, sectional top view — 14M CO2 L3

**UNIT–III**

5. A square prism of side of base 40mm and axis 80mm long, is resting on its base on HP. such that, a rectangular face of it is parallel to VP. Draw the development of the prism — 14M CO3 L3

**OR**

6. A vertical cone of 40 mm diameter of base and height 50 mm is cut by a cutting plane perpendicular to V.P and inclined at $30^0$ to the H.P so as to bisect the axis of the cone. Draw the development of the lateral surface of the truncated position of the cone — 14M CO3 L3

**UNIT–IV**

7. Draw the isometric view of a square plane of side length 40mm when the plane is i) Horizontal    ii) Vertical — 14M CO4 L3
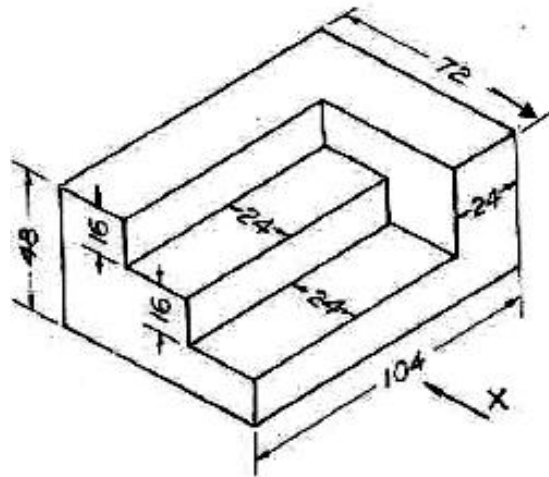
**OR**

8. Draw the isometric projection of a pentagonal prism of base side 25mm and axis length 50mm when the axis is i) Vertical  ii) Horizontal — 14M CO4 L3
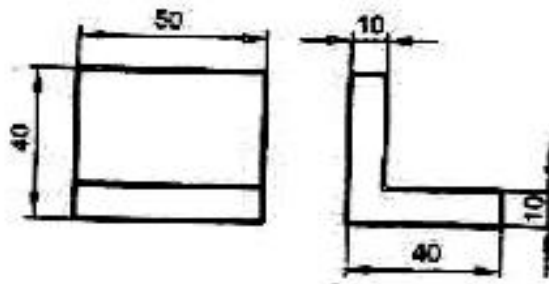
**UNIT–V**

9.    Draw the front view, top view and side view to the following isometric view



14M   CO5   L3

**OR**

10.    Draw the isometric view to the following orthographic views



14M   CO5   L3

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Hall Ticket Number :

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**Code: 20A321T**

**R-20**

I B.Tech. II Semester Supplementary Examinations June 2024
**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 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

| | | CO | BL |
|---|---|---|---|
| a) | Define Alloy | 1 | L1 |
| b) | Give two examples for eutectic systems | 2 | L2 |
| c) | Why aluminium has silver white luster whereas copper has reddish brown. | 3 | L2 |
| d) | Describe age hardening | 4 | L1 |
| e) | List the properties of cermets. | 5 | 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) | Write about crystal, space lattice and unit cell. | 6M | 1 | L1 |
| | b) | Draw B.C.C and F.C.C structures and calculate the atomic packing factor for B.C.C, F.C.C structures. | 6M | 1 | L2 |
| | | **OR** | | | |
| 3. | a) | Differentiate between substitutional and interstitial solid solutions with neat sketches. Give examples for each | 6M | 1 | L2 |
| | b) | Explain one dimensional defects in solids | 6M | 1 | L2 |
| | | **UNIT-II** | | | |
| 4. | | Sketch neatly the ideal iron-carbide binary equilibrium diagram, indicating temperature, composition and different phases present. | 12M | 2 | L2 |
| | | **OR** | | | |
| 5. | | Explain the phase diagram of binary isomorphous alloy system. | 12M | 2 | L1 |
| | | **UNIT-III** | | | |
| 6. | | Classify steels on carbon content and discuss on the properties and application of various types of steels. | 12M | 3 | L1 |
| | | **OR** | | | |
| 7. | a) | Differentiate between gray and Spheroidal graphite cast irons giving their application? | 6M | 3 | L2 |
| | b) | What properties are desirable in tool and die steels? | 6M | 3 | L2 |
| | | **UNIT-IV** | | | |
| 8. | a) | Discuss the effect of alloying elements on Fe-Fe3C phase diagram. | 6M | 4 | L2 |
| | b) | What are the different heat treatment processes? Explain any two. | 6M | 4 | L1 |
| | | **OR** | | | |
| 9. | a) | Explain the need of surface hardening? | 6M | 4 | L2 |
| | b) | Describe the principle of flame hardening and induction hardening? | 6M | 4 | L2 |
| | | **UNIT-V** | | | |
| 10. | a) | What are the outstanding properties of glass? State their applications? | 6M | 5 | L2 |
| | b) | How ceramic components are formed? Explain. | 6M | 5 | L2 |
| | | **OR** | | | |
| 11. | a) | List the advantages and application of composites | 6M | 5 | L2 |
| | b) | How composites are manufactured? Explain any one method in detail. | 6M | 5 | L2 |

*** End ***

**Code: 20A323T**

**R-20**

I B.Tech. II Semester Supplementary Examinations June 2024
## 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 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

| | | CO | BL |
|---|---|---|---|
| a) | State the Parallelogram law of forces. | 1 | 1 |
| b) | Differentiate perfect truss with imperfect truss. | 2 | 2 |
| c) | State the Parallel axis theorem. | 3 | 1 |
| d) | What are the applications of projectiles? | 4 | 1 |
| e) | What are the various types of impact? | 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) Classify the system of forces with neat sketches 5M 1 2

   b) Determine the resultant of four forces concurrent at the origin as shown in Fig. 1.



Fig.1

7M 1 3
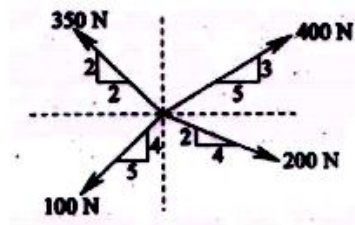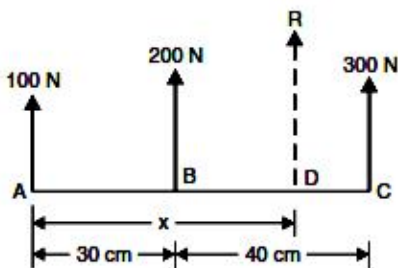
**OR**

3. a) State and prove Varignon's theorem. 6M 1 2

   b) Three like parallel forces 100 N, 200 N and 300 N are acting at points A, B and C respectively on a straight line ABC as shown in Figure. The distances are AB = 30 cm and BC = 40 cm. Find the resultant and also the distance of the resultant from point A on line ABC.



6M 1 3

#### UNIT-II

4. A block weighing 1500 N, overlying a 10° wedge on a horizontal floor and leaning against a vertical wall, is to be raised by applying a horizontal force to the wedge. Assuming the coefficient of friction between all the surface in contact to be 0.3, determine the minimum horizontal force required to raise the block. 12M 2 3

**OR**

5. Determine the forces in all the members of the truss shown in Fig. and indicate the magnitude and nature of the forces on the diagram of the truss. All inclined members are $60^0$ to horizontal and length of each member is 2m.
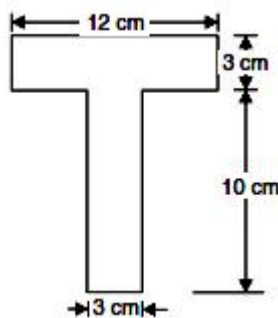


|  | 12 | 2 |
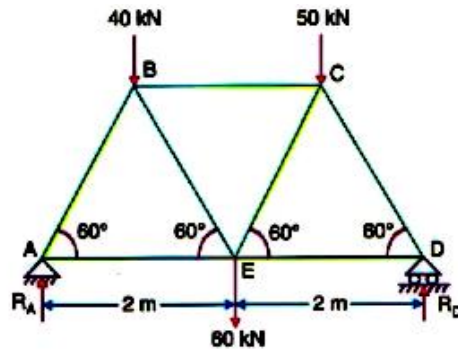
6. a) Find the location the centroid of a semicircular disk of radius r.  6M  3  3

   b) Find the centre of gravity of the T-section shown in Fig.



|  | 6M | 3 | 3 |

**OR**

7. a) Explain Pappus and Guldinus theorems.  6M  3  2

   b) Find the centroid of volume of a solid formed by a right circular cone of 100 mm base radius and a height of 150 mm placed over a cylinder having the same radius and a 75 mm height.  6M  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, $S = 2t^3+4t^2-6t+8$. Determine:

   (i) velocity at start, (ii) velocity after 5 seconds, (iii) acceleration at start and (iv) acceleration after 5 seconds.  12  4  3

**OR**

9. a) Derive the equations of motion for a body moving in a straight line.  6M  4  2

   b) Two balls are projected from the same point in directions inclined at $60^0$ and $30^0$ to the horizontal. If they attain the same maximum height, what is the ratio of their velocities of projection?  6M  4  4

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  6M  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.  6M  5  3

*** End ***

**Code: 20AC24T**

I B.Tech. II Semester Supplementary Examinations June 2024

## 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 )

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

 a)  What is a conservative force and give its expression?　　CO1　L1
 b)  Why inverse piezo-electric method is used to produce ultrasonics?　　CO2　L3
 c)  Define dielectric constant?　　CO3　L1
 d)  Explain the principle of an optical fiber.　　CO4　L2
 e)  List the temperature sensors.　　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)  Give the physical significance of the terms Gradient of a scalar, divergence and curl of a vector.　　6M　CO1　L3
 b)  What are three laws of Kepler and explain them.　　6M　CO1　L1

**OR**

3.  Derive an equation for angular velocity of rigid body.　　12M　CO1　L3

#### UNIT-II

4. a)  Suggest the remedies to build acoustically a good hall.　　5M　CO2　L5
 b)  Explain a piezo electric method of ultrasonic wave production.　　7M　CO2　L2

**OR**

5.  Describe acoustic grating and show it can be used to determine the velocity of ultrasonic wave.　　12M　CO2　L2

#### UNIT-III

6.  Derive the equation for electronic and ionic polarizability of dielectrics.　　12M　CO3　L3

**OR**

7. a)  Explain the hysteresis of ferromagnetic materials.　　6M　CO3　L2
 b)  Distinguish the soft and hard magnetic materials.　　6M　CO3　L2

#### UNIT-IV

8. a)  Explain the characteristics of lasers with diagrams.　　6M　CO4　L2
 b)  What are Einstein's coefficients? Derive the relation between Einstein's coefficients.　　6M　CO4　L3

**OR**

9.  Explain various types of optical fibers based on refractive index profile, materials and modes of propagation.　　12M　CO4　L2

#### UNIT-V

10. a)  What are the various types of sensors?　　8M　CO5　L1
 b)  List the applications of sensors.　　4M　CO5　L1

**OR**

11.  Summarize the Magnetostriction Sensor, Noncontact Magnetostrictive Sensor and Magnetostrictive Fiber Optic Sensor.　　12M　CO5　L2

*** End ***

**R-20**

**Code: 20AC21T**

I B.Tech. II Semester Supplementary Examinations June 2024

# 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 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) Solve $(D^2+5D+6)y=0$ | | CO1 | L3 |
| b) Solve $(x^2D^2+4xD+3)y=0$ | | CO2 | L3 |
| c) Form the partial differential equation by eliminating the arbitrary constants from $z=ax+by$ | | CO3 | L2 |
| d) Find $curl\ \bar{f}$ for $\bar{f}=z\bar{i}+x\bar{j}+y\bar{k}$ | | CO4 | L1 |
| e) State Green's theorem. | | 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) | Solve $(D^2+6D+9)y=e^{-2x}$ | 6M | CO1 | L3 |
| b) | Solve $(D^2+1)y=x$ | 6M | CO1 | L3 |

**OR**

| | | Marks | CO | BL |
|---|---|---|---|---|
| 3. | Solve $\dfrac{d^2y}{dx^2}+4y=\tan 2x$ by using method of variation of parameters. | 12M | CO1 | L3 |

### UNIT-II

| | | Marks | CO | BL |
|---|---|---|---|---|
| 4. | Solve $(1+x)^2\dfrac{d^2y}{dx^2}+(1+x)\dfrac{dy}{dx}+y=2\sin[\log(1+x)]$ | 12M | CO2 | L3 |

**OR**

| | | Marks | CO | BL |
|---|---|---|---|---|
| 5. | Solve $(x^2D^2-3xD+4)y=(1+x)^2$ | 12M | CO2 | L3 |

### UNIT-III

6. Form the partial differential equation by eliminating the arbitrary constants a, b from $(x-a)^2 + (y-b)^2 = z^2 \cot^2 r$    12M  CO3  L2

**OR**

7. Solve $x^2(y-z)p + y^2(z-x)q = z^2(x-y)$    12M  CO3  L3

### UNIT-IV

8. Find the directional derivative of $W = x^2 - 2y^2 + 4z^2$ at (1,1,-1) in the direction of $2\bar{i} + \bar{j} - \bar{k}$.    12M  CO4  L2

**OR**

9. Find $curl \bar{f}$ where $\bar{f} = grad(x^3 + y^3 + z^3 - 3xyz)$    12M  CO4  L2

### UNIT-V

10. Evaluate the line integral

$$\int_c [(x^2 + xy)dx + (x^2 + y^2)dy]$$

where c is the square formed by the lines $x = \pm 1 \, and \, y = \pm 1.$    12M  CO5  L2

**OR**

11. Verify Stoke's theorem for the function $\bar{F} = x^2\bar{i} + xy\bar{j}$ integrated round the square in the plane z=0 whose sides are along the lines $x=0, y=0, x=a, y=a.$    12M  CO5  L2

*** End ***