

Hall Ticket Number :

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R-20

Code: 20A326T

I B.Tech. II Semester Supplementary Examinations February 2023

Basic Mechanical Engineering

(Civil 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)

- | | | |
|--|-----|----|
| 1. Answer ALL the following short answer questions (5 X 2 = 10M) | CO | BL |
| a) Distinguish consumable and non-consumable electrodes. | CO1 | L2 |
| b) Distinguish drilling and milling. | CO2 | L2 |
| c) Name the types of piston rings. | CO3 | L1 |
| d) Define second law of thermodynamics. | CO4 | L1 |
| e) Define earth moving machines. | 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. Describe TIG welding process and write its applications. | 12M | CO1 | L2 |
| OR | | | |
| 3. Explain OAW welding process and write its advantages and disadvantages. | 12M | CO1 | L2 |
| UNIT-II | | | |
| 4. Illustrate the construction and working of lathe machine with neat diagram. | 12M | CO2 | L3 |
| OR | | | |
| 5. With neat diagram explain rolling process and write its applications. | 12M | CO2 | L2 |
| UNIT-III | | | |
| 6. Distinguish 4-Stroke and 2-Stroke IC engines. | 12M | CO3 | L3 |
| OR | | | |
| 7. Name the thermodynamic processes involved in 4-stroke CI engine and explain its working with neat sketch. | 12M | CO3 | L2 |
| UNIT-IV | | | |
| 8. Explain the vapor absorption refrigeration system with neat diagram. | 12M | CO4 | L2 |
| OR | | | |
| 9. Explain winter air-conditioning system with neat sketch | 12M | CO4 | L2 |
| UNIT-V | | | |
| 10. Name different types of transmission systems and briefly discuss any two. | 12M | CO5 | L2 |
| OR | | | |
| 11. With simple diagram explain bulldozers construction and working | 12M | CO5 | L2 |

*** End ***

Hall Ticket Number :									
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R-20

Code: 20AC21T

I B.Tech. II Semester Supplementary Examinations February 2023

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)

- | | | |
|---|-----|----|
| 1. Answer ALL the following short answer questions (5 X 2 = 10M) | CO | BL |
| a) Find the P.I of $(D^2 - 2D + 4)y = e^x \cos x$ | CO1 | L2 |
| b) Solve $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + y = \log x$ | CO2 | L3 |
| c) Find the partial differential equation of all planes passing through the origin. | CO3 | L2 |
| d) Find $\nabla \left(\nabla \cdot \frac{\vec{r}}{r} \right)$ | CO4 | L2 |
| e) State Stokes theorem. | CO5 | L3 |

PART-B

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

Marks CO BL

UNIT-I

- | | | | |
|--|-----|-----|----|
| 2. Solve $(D^2 - 4D + 4)y = 8x^2 e^{2x} \sin 2x$. | 12M | CO1 | L3 |
|--|-----|-----|----|

OR

- | | | | |
|--|-----|-----|----|
| 3. Solve, by the method of Variation of Parameters, $y'' - 2y' + y = e^x \log x$ | 12M | CO1 | L3 |
|--|-----|-----|----|

UNIT-II

- | | | | |
|---|-----|-----|----|
| 4. 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 $p^2 = 1/LC$. 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 $(Et/2L) \sin pt$. | 12M | CO2 | L3 |
|---|-----|-----|----|

OR

5. Solve $(2x-1)^2 \frac{d^2y}{dx^2} + (2x-1) \frac{dy}{dx} - 2y = 8x^2 - 2x + 3$ 12M CO2 L1

UNIT-III

6. a) Form the partial differential equation by eliminating the arbitrary function from $\phi\left(\frac{y}{x}, x^2 + y^2 + z^2\right) = 0$. 6M CO3 L2
- b) Solve the partial differential equation $\frac{p}{x^2} + \frac{q}{y^2} = z$. 6M CO3 L3

OR

7. Use Separation of Variables to solve $4u_x + u_y = 3u$ with $u(0, y) = 3e^{-y} - e^{-5y}$. 12M CO3 L3

UNIT-IV

8. a) Find the values of a and b so that the surfaces $ax^2 - byz = (a+2)x$ and $4x^2y + z^3 = 4$ may intersect orthogonally at the point $(1, -1, 2)$. 6M CO4 L2
- b) Show that $\frac{\bar{r}}{r^3}$ is solenoidal. 6M CO4 L3

OR

9. a) Find constants a, b, c so that the vector $\bar{A} = (x+2y+az)\bar{i} + (bx-3y-z)\bar{j} + (4x+cy+2z)\bar{k}$ is irrotational. Also find ϕ such that $\bar{A} = \nabla\phi$ 6M CO4 L2
- b) Prove that $\text{div curl } \bar{f} = 0$. 6M CO4 L3

UNIT-V

10. Evaluate $\iint_S \bar{F} \cdot \bar{n} \, ds$ where $\bar{F} = 12x^2y\bar{i} - 3yz\bar{j} + 2z\bar{k}$ and S is the portion of the plane $x + y + z = 1$ included in the first octant. 12M CO5 L5

OR

11. Verify Green's theorem for $\int_c [(3x^2 - 8y^2)dx + (4y - 6xy)dy]$ where c is the region bounded by $x=0$, $y=0$ and $x+y=1$. 12M CO5 L5

*** End ***

Hall Ticket Number :										
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R-20

Code: 20A323T

I B.Tech. II Semester Supplementary Examinations February 2023

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)

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

	CO	BL
a) What is meant by composition and resolution of forces?	1	1
b) What is the difference between coefficients of static and kinetic friction?	2	2
c) What do you mean by first moment of area and second moment of area?	3	2
d) Write the equations of plane motion of a rigid body.	4	1
e) Define impulse and momentum. State impulse-momentum principle in translation.	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. State and prove Varignon's theorem applied to concurrent forces. 12M 1 2

OR

3. The force system shown in Figure 1 has a resultant of 200 N pointing up along the Y-axis. Compute the values of F and required to give this resultant. Assume the units of forces in Newtons.

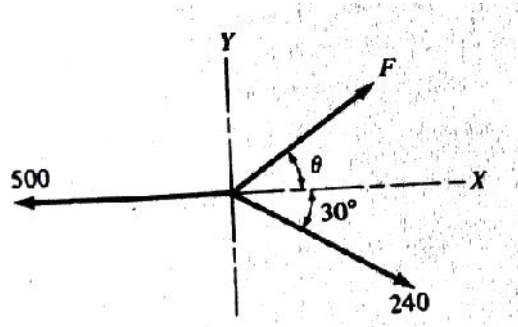


Figure 1

12M 1 3

UNIT-II

4. Two identical blocks A and B are connected by a rod and rest against vertical and horizontal planes, respectively, as shown in Figure 2. If sliding impends when $\theta = 45^\circ$, determine the coefficient of friction μ , assuming it to be the same at both floor and wall. 12M 2 3

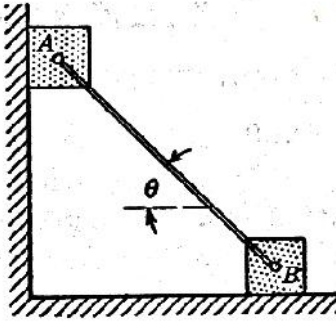


Figure 2

OR

5. Find the forces in all the members of the truss shown in Figure 3.

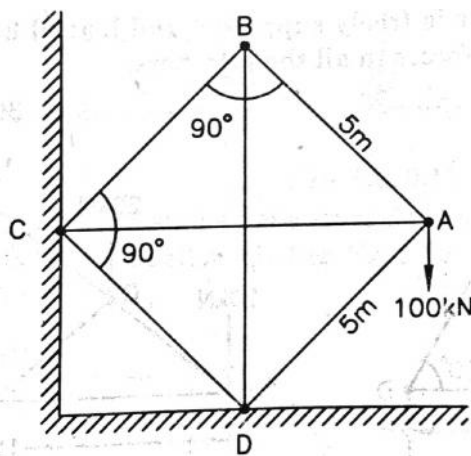


Figure 3

12M 2 3

UNIT-III

6. Determine the centroid of the shaded triangular area shown in Figure 4 with respect to the given X and Y – axes. Assume the units in figure in meters.

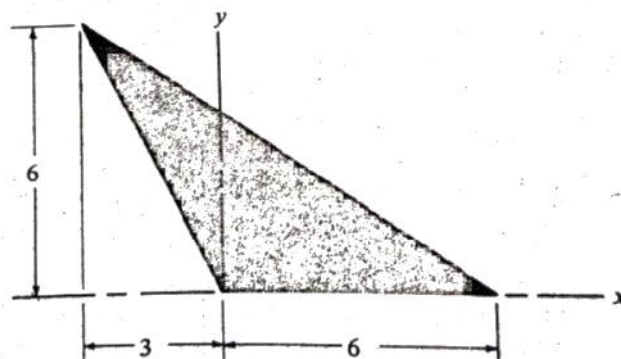


Figure 4

12M 3 3

OR

7. Calculate the moment of inertia I_{xx} of a homogeneous right circular cone with respect to an axis X through the vertex and parallel to the plane of the base.

12M 3 3

UNIT-IV

8. a) Define normal and tangential components of accelerations. Write the equations. 4 4 2
- b) The pilot of an airplane A flying horizontally with constant speed $v = 450$ kmph at an elevation $h = 600$ m above a level plain wishes to bomb a target B on the ground (Figure 5). At what angle below the horizontal should he see the target at the instant of releasing the bomb in order to score a hit?

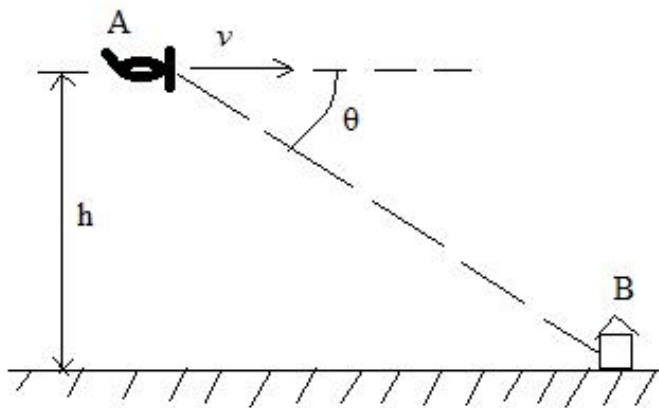


Figure 5

8 4 3

OR

9. a) What is instantaneous center of rotation of a rigid body making plane motion? Explain with an example. 6M 4 2
- b) A locomotive runs along a straight level track with constant acceleration $a = 0.2g$. Find the total acceleration of a point at the top of the rim of a driver wheel of radius $r = 1$ m when the speed of the locomotive is 25 kmph. 6M 4 3

UNIT-V

10. a) State and prove Impulse – Momentum principle. 6M 5 2
- b) A locomotive weighing 60 tons has a velocity of 15 kmph and backs into a freight car weighing 10 tons that is at rest on a level train track. After the coupling is made, with what velocity ' v ' will the entire system continue to move? 6M 5 3

OR

11. A solid circular cylinder and a sphere are started from rest at the top of an inclined plane at the same time, and both roll without sliding down the plane. If, when the sphere reaches the bottom of the incline, the cylinder is 12 m behind it, what is the total length S of the incline? 12M 5 3

*** End ***

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R-20

Code: 20AC24T

I B.Tech. II Semester Supplementary Examinations February 2023

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)

- | | | |
|--|-----|----|
| 1. Answer ALL the following short answer questions (5 X 2 = 10M) | CO | BL |
| a) Give examples of inertial and non-inertial frames of reference. | CO1 | L1 |
| b) Classify A, B and C scan displays? | CO2 | L4 |
| c) Define is Weiss domain theory of ferromagnetism? | CO3 | L1 |
| d) State and explain in brief the principle of communication through optical fibers. | CO4 | L2 |
| e) Mention two application of 'Hall effect' as a sensor'. | 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) Given $\vec{r} = 2x^2 + 3y^3 - 4z$, determine grad , div(grad) , curl(grad) | 8M | CO1 | L3 |
| b) What is Foucault's pendulum and where is it applied? | 4M | CO1 | L3 |

OR

- | | | | |
|---|----|-----|----|
| 3. a) Discuss Newton's laws of motion in rotating frame of reference. | 4M | CO1 | L2 |
| b) Explain the terms center of mass, torque and newton's laws of motion in a frame of reference with constant angular velocity. | 8M | CO1 | L3 |

UNIT-II

- | | | | |
|---|----|-----|----|
| 4. a) Derive Sabine's formula using growth and decay method and mention two methods to determine acoustic absorption coefficient. | 6M | CO2 | L6 |
| b) Analyze the method of magneto strictive ultrasonic production. | 6M | CO2 | L4 |

OR

5. a) Enumerate the factors and concerned remedies for an acoustically good building. 4M CO2 L1
- b) What is pulse echo system? Explain how is it used in transmission and reflection modes for nondestructive testing. 8M CO2 L4

UNIT-III

6. a) What is Polarisability and derive an expression for ionic polarisability of an ionic substance. 6M CO3 L6
- b) What is magnetic moment and derive an expression for Bohr magneton. 6M CO3 L6

OR

7. a) What are the different types of polarization mechanisms? When radii two atoms are in the ratio 1:3 what is the electronic polarization ratio of the two atoms and why. 8M CO3 L4
- b) Differentiate hard and soft magnetic materials along with a hysteresis curve. 4M CO3 L4

UNIT-IV

8. a) Deduce a relation between Einstein's coefficients. 6M CO4 L6
- b) Differentiate optical fibers based on the refractive index profile 6M CO4 L4

OR

9. a) Explain the terms population inversion, pumping mechanism and justify why population inversion is required for lasing action. 6M CO4 L5
- b) What is acceptance angle and evaluate what happens to the numerical aperture value of the given fiber if is used in water of refractive index 1.33 in comparison to using in air. 6M CO4 L5

UNIT-V

10. a) What is a sensor and what are the basic components in a sensor? 6M CO5 L1
- b) Explain active and passive optical fiber sensors and device an optical fiber pressure sensor. 6M CO5 L6

OR

11. a) What is magnetostriction and outline the working of magnetostrictive sensor. 6M CO5 L4
- b) Explain the construction and working of bimetallic strip temperature sensor. 6M CO5 L2

*** End ***

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R-20

Code: 20A223T

I B.Tech. II Semester Supplementary Examinations February 2023

Basic Electrical and Electronics Engineering

(Common to CE, CSE and AI&DS)

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)

1. Answer ALL the following short answer questions (5 X 2 = 10M)	CO	Blooms Level
a) State cork screw rule?	1	1
b) Draw the connection diagram of Swinburne's test?	2	2
c) How the copper loss varies with power factor in a transformer?	3	1
d) How P-N junction is formed in a diode?	4	1
e) Write the classification of instruments?	5	1

PART-B

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

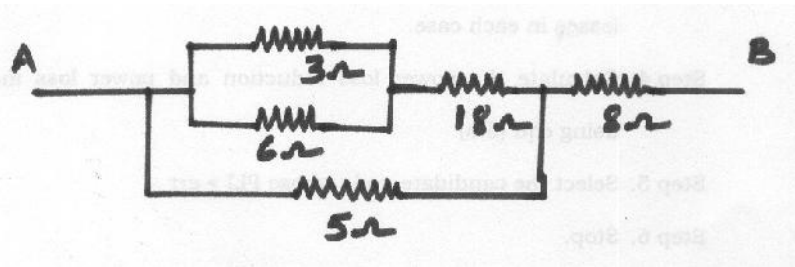
Marks CO BL

UNIT-I

- | | | | |
|---|----|---|---|
| 2. a) Three resistors R1, R2 and R3 are connected in series across a constant voltage V. The voltage across R1 is 20V. The power consumed by R2 is 25 W, R3=2ohms. Find the voltage V if the current is 5A? | 6M | 1 | 3 |
| b) Discuss about static and dynamic induced EMF? | 6M | 1 | 2 |

OR

3. Calculate the effective resistance of the following combination of resistances and the voltage drops across each resistance, when a voltage of 60V is applied between points A and B as shown in fig.



12M 1 3

UNIT-II

- | | | | |
|---|-----|---|---|
| 4. a) Derive the EMF equation of DC Generator? | 6M | 2 | 2 |
| b) Explain the Brake test of DC motor? | 6M | 2 | 2 |
| OR | | | |
| 5. Explain the speed control methods of DC motor? | 12M | 2 | 2 |

UNIT-III

- | | | | |
|--|----|---|---|
| 6. a) Explain the Brake test on three-phase induction motor? | 6M | 3 | 2 |
| b) Discuss the principle of operation of three-phase transformer? | 6M | 3 | 2 |
| OR | | | |
| 7. a) Explain the calculation of regulation with synchronous impedance method? | 6M | 3 | 2 |
| b) Explain the calculation of efficiency and regulation of transformer? | 6M | 3 | 2 |

UNIT-IV

- | | | | |
|---|----|---|---|
| 8. a) Explain the operation of diode half-wave rectifier? | 6M | 4 | 2 |
| b) Describe the diffusion process that takes place at the p-n junction, and explain the presence of depletion region? | 6M | 4 | 2 |
| OR | | | |
| 9. a) Define | | | |
| i) active ii) saturation and cut-off region in a transistor? | 6M | 4 | 2 |
| b) Sketch characteristics of transistor CE configuration? | 6M | 4 | 2 |

UNIT-V

- | | | | |
|--|----|---|---|
| 10. a) Explain the principle of cathode ray tube? | 6M | 5 | 2 |
| b) Explain about different types of Fuses? | 6M | 5 | 2 |
| OR | | | |
| 11. a) In a house there are 5 lamps 25 watts used 14 hours per day, a 200 W refrigerator used 24 hours per day, and a 125 watt water pump used 8 hours per day. How much electrical energy used for a month (30 days)? | 9M | 5 | 3 |
| b) Discuss the applications of CRO? | 3M | 5 | 2 |

*** End ***