# SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
## (AUTONOMOUS)
### B.Tech. I Year II Semester Regular & Supplementary Examinations June-2025
### ENGINEERING MECHANICS
(Common to CE & MECH )

**Time: 3 Hours**             **Max. Marks: 70**

## PART-A
(Answer all the Questions 10 x 2 = 20 Marks)

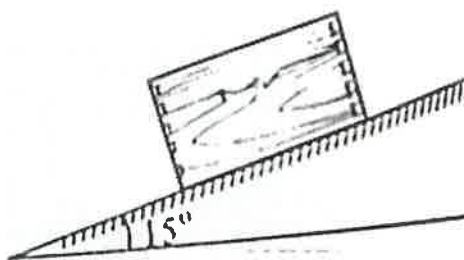| | | | | | |
|---|---|---|---|---|---|
| 1 | a | Discuss briefly the application of moment of force. | CO1 | L2 | 2M |
| | b | Explain cone of friction. | CO1 | L2 | 2M |
| | c | State and explain Triangle Law of forces. | CO2 | L2 | 2M |
| | d | What are condition of equilibrium of Non-Concurrent System of Forces. | CO2 | L2 | 2M |
| | e | Define the terms centroid and centre of gravity. | CO3 | L2 | 2M |
| | f | What are values of moment of inertia and polar moment of inertia for a circle of diameter 'd'? | CO3 | L2 | 2M |
| | g | Explain the terms Time of Flight and Range in projectile motion. | CO4 | L2 | 2M |
| | h | Explain the terms Work and Energy. Give their units in SI system. | CO4 | L2 | 2M |
| | i | Discuss angular displacement? What is units? | CO5 | L2 | 2M |
| | j | Explain the terms (i) angular velocity and (ii) angular acceleration. | CO5 | L2 | 2M |

## PART-B
(Answer all Five Units 5 x 10 = 50 Marks)

### UNIT-I

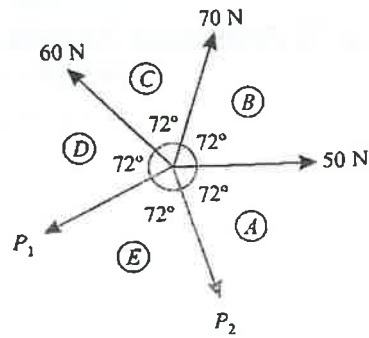| | | | | | |
|---|---|---|---|---|---|
| 2 | | The following forces act at a point: <br> (i) 20 N inclined at 30o towards North of East <br> (ii) 25 N towards North <br> (iii) 30 N towards North West, and <br> (iv) 35 N towards at 40o towards South of West. Find the magnitude and direction of the resultant force. | CO1 | L3 | 10M |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 3 | a | Explain the following: <br> (i) Coefficient of static friction <br> (ii) Coefficient of kinetic friction <br> (iii) Limiting force of friction <br> (iv) Angle of friction <br> (v) Angle of repose. | CO1 | L2 | 5M |
| | b | A wooden block of mass 40 kg is on rough inclined plane as shown in Figure. Find the frictional force at surface in contact if μs = 0.4 and μk = 0.35. | CO1 | L3 | 5M |

| 4 | a | Five strings are tied at a point and are pulled in all directions, equally spaced from one another as shown in Figure.. If the magnitude of the pulls on three consecutive strings is 50 N, 70 N and 60 N respectively, find graphically the magnitude of the pulls on two other strings. | CO2 | L3 | 10M |
|---|---|---|---|---|---|

OR

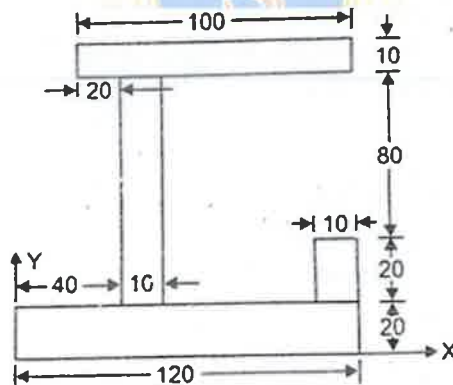| 5 | a | A simply supported beam of length 10 m, carries the uniformly distributed load and two point loads as shown in Figure. calculate the support reactions. | CO2 | L3 | 10M |
|---|---|---|---|---|---|
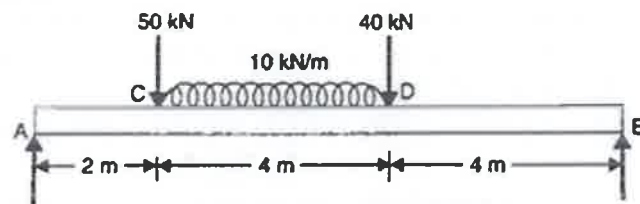
UNIT-III

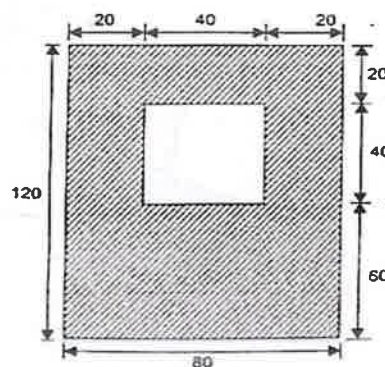| 6 | a | Determine the centroid of the built-up section shown in Figure. Express the coordinates of the centroid with respect to x and y axes shown. | CO3 | L3 | 10M |
|---|---|---|---|---|---|

OR

| 7 | | The cross-section of a rectangular hollow beam is as shown in Figure. Determine the polar moment of inertia of the section about centroidal axes. | CO3 | L3 | 10M |
|---|---|---|---|---|---|

## UNIT-IV

**8** A stone is thrown vertically upwards with a velocity of 19.6 m/s from the top of tower 24.5 m high. Calculate:  **CO4  L3  10M**
  (i) time required for the stone to reach the ground
  (ii) velocity of the stone in its downward travel at the point in the same level as the point of projection.
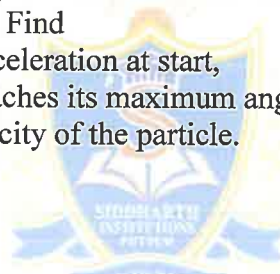  (iii) the maximum height to which the stone will rise in its flight.

### OR

**9** A 20 kN automobile is moving at a speed of 70 kmph when the brakes are fully applied causing all four wheels to skid. Determine the time required to stop the automobile  **CO4  L3  10M**
(a) on concrete road for which $\mu = 0.75$.
(b) on ice for which $\mu = 0.08$.

## UNIT-V

**10** The angular acceleration of a flywheel is given by $\alpha = 12 - t$, where $\alpha$ is in rad/sec2 and t is in seconds. If the angular velocity of the flywheel is 60 rad/sec at the end of 4 seconds, determine the angular velocity at the end of 6 seconds. How many revolutions take place in these 6 seconds?  **CO5  L3  10M**

### OR

**11** The equation for angular displacement of a body, moving in a circular path of radius 200 m is given by $\theta = 18t + 3t2-2t3$ where $\theta$ is the angular displacement at the end of t sec. Find  **CO5  L3  10M**
  (i) angular velocity and acceleration at start,
  (ii) time when the body reaches its maximum angular velocity; and
  (iii) maximum angular velocity of the particle.

*** END ***