B.E./B.TECH. DEGREE EXAMINATIONS: JUNE 2010

Second Semester

MEC102: ENGINEERING MECHANICS

(Common to B.E – Civil Engineering, Aeronautical Engineering, Mechanical Engineering,

Mechatronics Engineering and B.Tech-Terxtile Technology, Fashion Technology & Biotechnology)

Time: Three Hours   **Maximum Marks: 100**

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. The unit for mass is

   A. kg   B. N   C. s   D. W

2. Forces acting at the same point on a body are called

   A. Coplanar forces   B. Concurrent forces   C. Non - Coplanar forces   D. Parallel forces

3. Steel is an example for

   A. Rigid body   B. Elastic body   C. Non - Rigid body   D. Plastic body

4. If a body returns back to its original position, as soon as the disturbing force is removed, the equilibrium is said to be

   A. Stable   B. Unstable   C. Neutral   D. Parallel

5. The point at which the total area of a plane figure is assumed to be concentrated is known as

   A. Centre of gravity   B. Centroid   C. Moment of Inertia   D. Mass moment of Inertia

6. The unit for polar moment of inertia is

   A. m^4 B. N.m   C. kg. m^2 D. J

7. Friction experienced by a body during rest is called

   A. Dynamic friction   B. Static friction   C. Sliding friction   D. Rolling friction

8. The motion of an aeroplane flying at different heights and in different directions is an example for

   A. Rectilinear motion   B. Spatial motion   C. Curvilinear motion   D. Circular motion

9. If the velocities of the two bodies before collision is directed along the line of impact, it is called

   A. Indirect impact   B. Direct impact   C. Oblique impact   D. Angler impact

10. The product of mass of a body and its velocity is called

   A. Impact   B. Momentum   C. Moment   D. Moment of Inertia

PART B (10 x 2 = 20 Marks)

11. What is Lami's theorem?

12. Define coplanar forces.

13. State the Varignon's principle.

14. What is meant by a couple?

15. Define moment of inertia.

16. What is parallel axis theorem?

17. What do you understand by a wedge?

18. What is belt friction?

19. Differentiate between rectilinear and curvilinear motion.

20. What is the principle of work and energy?

PART C (5 x 14 = 70 Marks)

21. (a) A string of length 20 cm is attached to a point A on a smooth vertical wall and to a point C on the surface of a sphere of radius 10 cm as shown in figure 1. The sphere, whose weight is 300 N hangs in equilibrium against the wall. Find the tension in the string and the reaction of the wall.
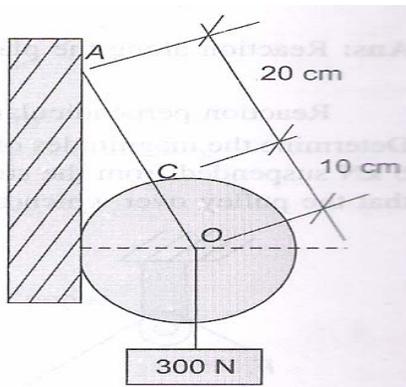
Figure 1

(OR)

(b) The following forces act at a point

      (i) 10 N inclined 20° towards North East

      (ii) 15 N towards North

      (iii) 15 N towards North West and

      (iv) 20 N inclined at 30° towards South West

    Find the magnitude and direction of the resultant force.

22. (a) Four forces act tangentially on a circle of radius 2 m as shown in figure 2. Find the magnitude, inclination, and distance of the resultant from the centre of the circle.
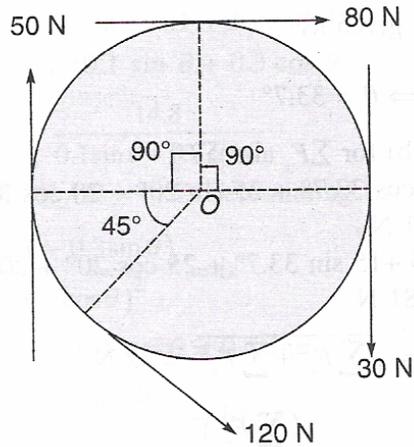
Figure 2

(OR)

(b) Explain the various types of supports and their reactions with neat sketches.

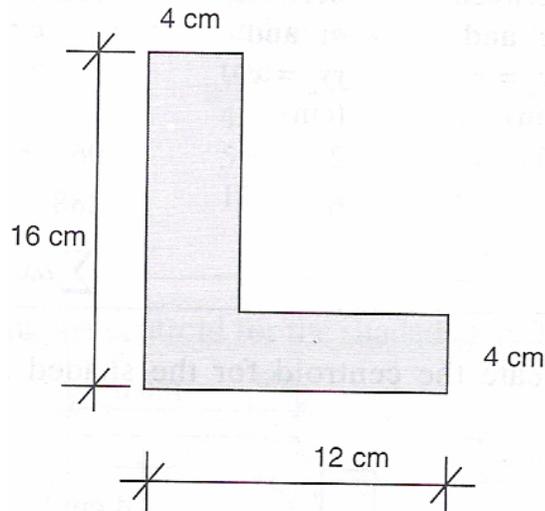23. (a) Locate the centroid for the shaded area shown in figure 3.

Figure 3

(OR)

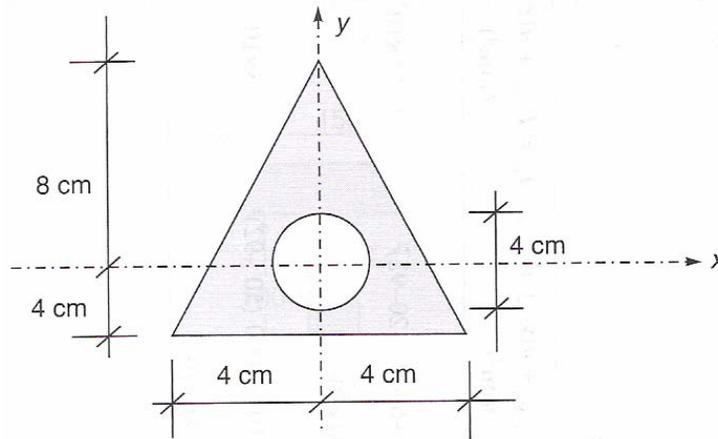(b) Find the area moment of inertia of I_{xx} and I_{yy} for the shaded area shown in figure 4.

Figure 4

24. (a) A particle under a constant deceleration is moving in a straight line and covers a distance of 20 m in the first 2 s and 40 m in the next 5 s . Calculate the distance it covers in subsequent 3 s and the total distance covered by it before it comes to rest.

(OR)

(b) A mass of 12 kg traveling to the right with a speed of 8 m/s collides with another mass of 20 kg traveling to the left with a speed of 25 m/s. If the coefficient of restitution is 0.60, find the velocities of the bodies after the collision and loss of kinetic energy. What is the impulse acting on each body during impact?

25. (a) A body lying on a horizontal plane is able to start to move when a 200 N force is applied parallel to the horizontal plane. If this force is replaced with a force of 150 N acting 30° to the X-axis, find out the coefficient of friction and weight of the body.

(OR)

(b) A ladder of length 10 m and weight 300 N is leaning against a vertical wall with an angle of 30° to the vertical. A man of weight 500 N climbs the ladder. Find the position of the man at the instant the ladder begins to slip. The coefficient of friction for all surfaces is 0.3.

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