

B.E / B.TECH DEGREE EXAMINATIONS: JUNE 2013

Second Semester

MEC102:ENGINEERING MECHANICS

(Common to AERO, AU, CIVIL, MCE, ME, FT, BT & TXT)

Time: Three Hours**Maximum Marks: 100****Answer all Questions:-****PART A (10 x 1 = 10 Marks)**

1. The third unknown force of coplanar concurrent system in equilibrium is obtained by
 - a) Couple
 - b) polygon of forces
 - c) Functional polygon
 - d) Triangles of forces
2. The dimension of gravitational constant in MLT system are
 - a) $M^{-1}L^3T^2$
 - b) $M^{-3}L^1T^{-2}$
 - c) $M^{-2}L^3T^{-1}$
 - d) ML^3T^{-2}
3. The forces F and $-F$ having the same magnitude, parallel lines of action and opposite sense are said to form a
 - a) Moment
 - b) Couple
 - c) Force
 - d) None of these
4. Example of rigid body is
 - a) Cast iron
 - b) Springs
 - c) Wires
 - d) None of these
5. The moment of inertia of a rectangular section about x-axis is given by
 - a) $bd^3/12$
 - b) $db^3/12$
 - c) $bd^4/12$
 - d) $db^4/12$
6. Polar moment of inertia is
 - a) $I_p = I_{xx} + I_{yy}$
 - b) $I_p = I_{xx} \times I_{yy}$
 - c) $I_p = I_{xx} - I_{yy}$
 - d) $I_p = I_{xx} / I_{yy}$
7. A ladder is resting on ground and leaning against a smooth wall; the force of friction is _____ at upper end
 - a) Maximum
 - b) Zero
 - c) Minimum
 - d) Unity
8. ----- are used to lift heavy blocks, machinery etc
 - a) wedges
 - b) Cylinders
 - c) spheres
 - d) Rollers
9. The simplest motion is along a straight line and such motion is
 - a) Rectilinear motion
 - b) Curvilinear motion
 - c) Projectile motion
 - d) None of these
10. The freely projected particle which moves under the combined effect of vertical and horizontal motion is
 - a) Upward motion
 - b) Downward motion
 - c) Projectile motion
 - d) None of the above

PART B (10 x 2 = 20 Marks)

11. What is equilibrant?
12. What is meant by free body diagram?

13. What is meant by a couple?
14. State varignon's theorem.
15. What is principal axis?
16. State parallel axis theorem.
17. What is impending motion?
18. What is angle of repose?
19. Define potential energy.
20. State law of conservation of energy.

PART C (5 x 14 = 70 Marks)

21. a) A string ABCD, attached to two fixed points A and D has two equal weight of 1000 N attached to it at B and C. The weights rests with a position AB and CD inclined at the angle of 30° and 60° respectively, to the vertical as shown in fig 1. Find the tension in the portions AB, BC and CD of the string, if the inclination of the portion BC with the vertical is 120° .

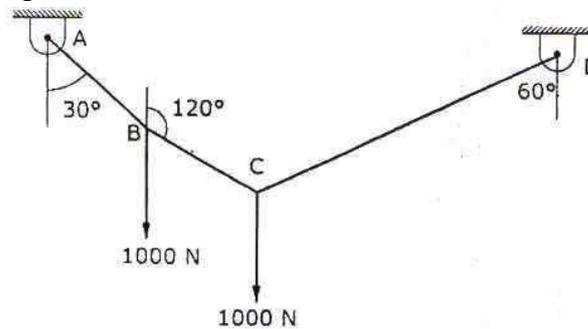


Figure-1

(OR)

- b) The spherical shells rest between two vertical columns as shown in fig 2. The radius of the smaller shell is 10 cm and its weight is 36 N, the radius of the larger shell is 15 cm and its weight is 120 N. The distance between two columns is 45 cm. Assume that the reaction at the points A,B,C,D are normal to the surface. Find the magnitude of the reaction at A,B,C and D.

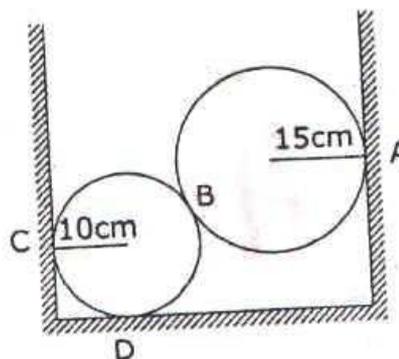


Figure-2

22. a) Four forces act on a $700\text{ mm} \times 375\text{ mm}$ plate is shown in fig 3.
- a) Find the resultant of these forces
 - b) Locate the two points, where the line of action of the resultant intersects the edges of the plate.

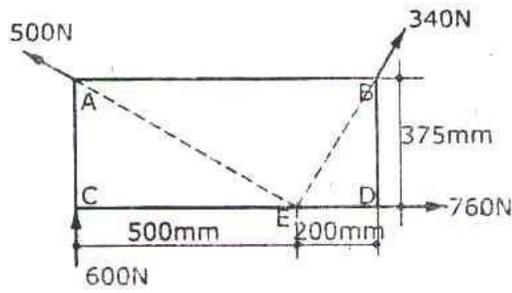


Figure-3

(OR)

- b) Find the moment of inertia of an angle section shown in fig 4. about its centroidal axes.

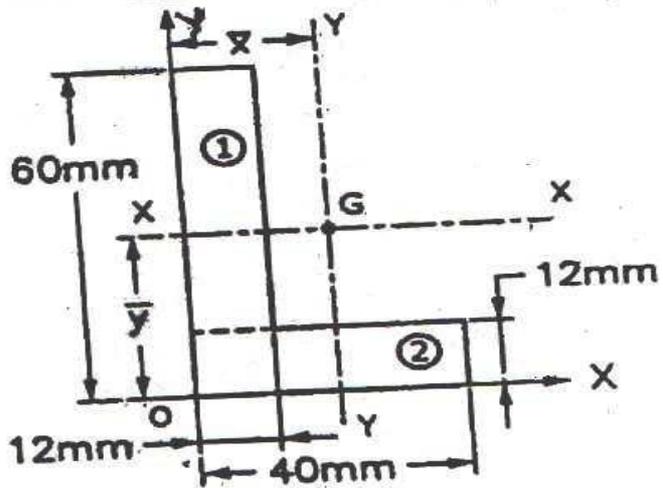


Figure-4

23. a) For the plane area shown in fig 5, determine the first moment with respect to the x and y axis and the location of the centroid.

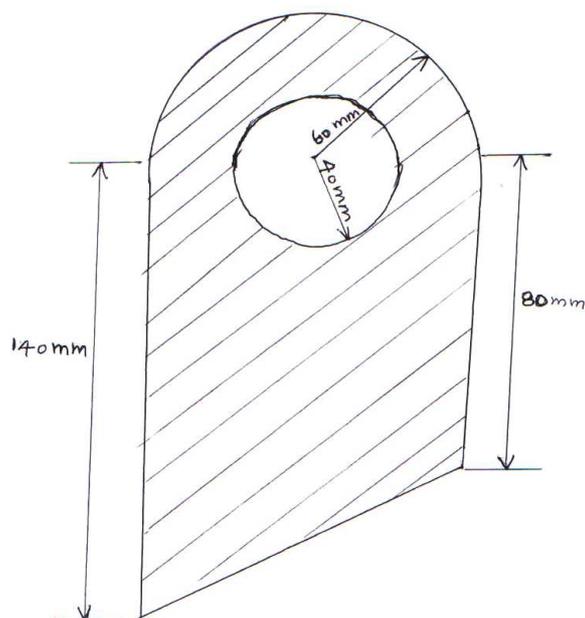


Figure-5

(OR)

- b) A body falling freely under the action of gravity passes two points 10 m apart, vertically in 0.2 sec. From what height above the higher point did it start to fall. $g=9.81\text{m/s}^2$

24. a) A body of weight 250 N is pulled up an inclined plane by a force of 150 N. The Inclined plane is 25° inclined to the horizontal and the force applied is parallel to the plane. Determine the coefficient of friction.

(OR)

- b) A ladder 7 m long and 200 N weight placed against a vertical wall in a position where its inclination to the vertical is 40° . A man weighing 400 N climbs the ladder and at what position will he induce slipping. The coefficient of friction between the ladder and the wall is 0.4 and between the ladder and the floor is 0.5.

25. a) Two weights 80 N and 20 N are connected by a thread and move along rough horizontal surface under the action of force 40 N applied to the first weight of 80 N as shown in fig 6. The co-efficient of friction between the sliding surface of the weight and plane is 0.3. Determine the velocity of the system after 2 sec. Also determine the tension in the string using impulse-momentum equation.

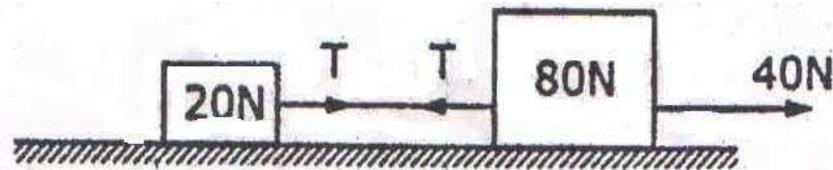


Figure-6

(OR)

- b) A projectile is aimed at a mark on the horizontal plane through the point of projection and falls 12 m short when the angle of projection is 15° . When it is tried again it overshoots the mark by 24 m when the angle of projection is 45° . Find the correct angle of projection to hit the mark. Velocity of projection is constant in all the cases.
