6. A beam AB 10 meters long has supports at its ends A and B. It carries a point load of 5 kN at 3 meters from A and a point load of 5 kN at 7 meters from A and a uniformly distributed load of 1 kN per meter between the point loads. Draw the shear force and bending moment diagrams for the beam. **15**

Section D

7. (a) An automobile enters a curved road at 30 km/hr and then leaves at 48 km/hr. The curved road is in a quarter of a circle and has a length of 400 m. If the car travels at constant acceleration along the curve, calculate the resultant acceleration at both ends of the curve. **7.5**

   (b) A wheel rotating at 60 rpm is uniformly accelerated for 60 seconds during which it makes 60 revolutions. Find : **7.5**

   (i) Angular velocity at the end of 60 seconds

   (ii) Time required for speed to reach 150 rpm.

8. (a) A stone 10 kg mass falls through a height of 10 m and penetrates into a wet ground. The resistance to penetration is 5000 N and it is constant. Find the distance of penetration in the ground by the stone. **7.5**

MAR-21-210004

B. Tech. EXAMINATION, March 2021

Semester I & II (CBCS)

ENGINEERING MECHANICS

ME-101

Time : 2 Hours   *Maximum Marks :* 60

Note : Attempt *Four* questions in all, selecting *one* question from each Sections A, B, C and D. All questions carry equal marks. Assume missing data suitably, if any.
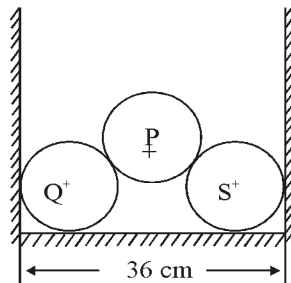
Section A

1. (a) A body of 70 kN weight is suspended by two strings whose lengths are 6 cm and 8 cm from points in the same horizontal level. The horizontal distance between the two points is 10 cm. Determine the tensions in the strings. **7.5**

(b) Two forces P_1 and P_2 acting at a point have a resultant R. If P_2 be doubled, R is doubled. Again, if the direction of P_2 is reversed, then R is doubled, show that :

$$P_1 : P_2 : R = \sqrt{2} : \sqrt{3} : \sqrt{2}.$$ **7.5**

2. (a) Three cylinders weighing 400 N each and 16 cm in diameter are placed in a channel of 36 cm width as shown in Figure 1. Determine the following : **7.5**

  (i) The pressure exerted by the top cylinder P on cylinder Q.

  (ii) The pressure exerted by the cylinder Q on the horizontal floor.

  (iii) The pressure exerted by the cylinder Q on the vertical wall.

36 cm

Fig.1

(b) State and prove Varignon's theorem. **7.5**

Section B

3. (a) Determine the minimum angle θ at which a uniform ladder can be placed against a wall without slipping under its own weight. The coefficient of friction for all surfaces is 0.2. **7.5**

  (b) What is the purpose of wedge ? Explain wedge friction with the help of free body diagrams. **7.5**

4. (a) A body consists of a solid hemisphere of radius 4 cm and right circular solid cone of height 12 cm. The hemisphere and cone has a common base and are made of same material. Locate the position of centre of gravity of the composite body. **7.5**

  (b) Derive the relation for moment of inertia of triangular lamina about its centroidal axis. **7.5**

Section C

5. What are the assumptions made while analyzing framed structure ? Explain step by step procedure of method of joints to analyze framed structures. **15**

(b) A body of 10 kg mass moving towards right with a speed of 8 m/s strikes with another body of 20 kg mass moving towards left with 25 m/s. Determine :

(i) Final velocities of two bodies

(ii) Loss in kinetic energy due to impact

(iii) Impulse acting on either body during impact.

Take coefficient of restitution between the bodies as 0.65. **7.5**

9. (a) What is principle of transmissibility of force ?

(b) What is a couple ?

(c) Define angle of repose.

(d) Sketch differential screw jack.

(e) Differentiate between centroid and centre of gravity.

(f) What is a redundant frame ?

(g) Define point of contraflexture.

(h) What are different types of beams ?

(i) What is general plane motion ?

(j) State D' Alembert's principle. **1.5×10=15**