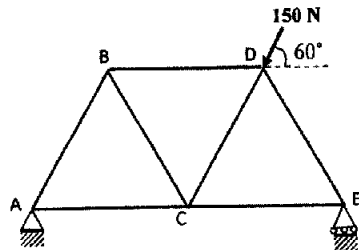
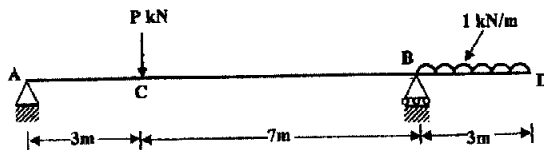


Section C

5. Determine the magnitude and nature of forces in all the members of the truss loaded as shown in the figure below and tabulate the results. Length of all the members is 4 m. 10



6. For the beam shown in figure below find the magnitude of load P in kN in order that the reactions of the beam may be equal. Draw the shear force and bending moment diagram and locate the point of contraflexure. 10



July-22-00210

B. Tech. EXAMINATION, 2022

Semester II (CBCS)

ENGINEERING MECHANICS

ME-101

Time : 3 Hours

Maximum Marks : 60

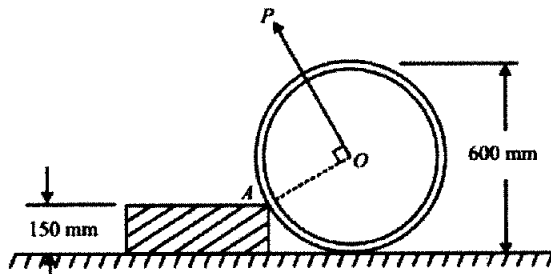
The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt Five questions in all, selecting one question from each Section A, B, C and D. Q. No. 9 is compulsory.

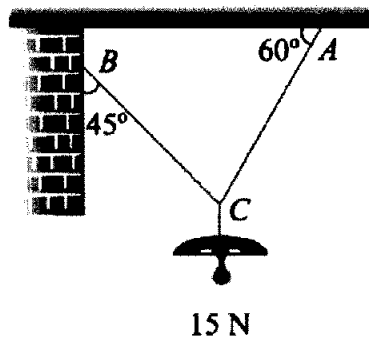
Section A

1. A uniform wheel of 600 mm diameter, weighing 5 kN rests against a rigid rectangular block of 150 mm height as shown in figure below. Find the least pull,

through the center of the wheel, required just to turn the wheel over the corner A of the block. Also find the reaction on the block. Take all the surfaces to be smooth. 10

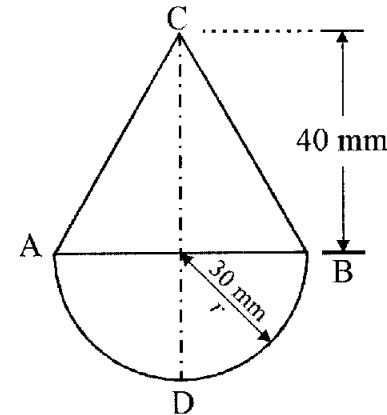


2. An electric light fixture weighing 15 N hangs from a point C, by two strings AC and BC. The string AC is inclined at  $60^\circ$  to the horizontal and BC at  $45^\circ$  to the horizontal as shown in Fig. Using Lami's theorem, or otherwise, determine the force in the strings AC. 10



**Section B**

3. A body consists of a right circular solid cone of height 40 mm and radius 30 mm placed on a solid hemisphere of radius 30 mm of the same material. Find the position of center of gravity of the body. 10



4. Find the force required to move a load of 300 N up a rough plane, the force being applied parallel to the plane. The inclination of the plane is such that when the same load is kept on a perfectly smooth plane inclined at the same angle, a force of 60 N applied at an inclination of  $30^\circ$  to the plane, keeps the same load in equilibrium. Assume coefficient of friction between the rough plane and the load to be equal to 0.3. 10

- (f) Define point of contraflexure in a beam.
- (g) State Varignon's theorem.
- (h) State the importance of shear force and bending moment diagram.
- (i) State D' Alembert's Principle.
- (j) Define Moment and Couple of a force.  $2 \times 10 = 20$

### Section D

- 7. A riveting machine is driven by a 4 kW motor. The moment of inertia of the rotating part is equivalent to  $140 \text{ kg-m}^2$  at the shaft on which the flywheel is mounted. At the commencement of operation, the flywheel is making 240 r.p.m. If closing a rivet occupies 1 second and consumes 10 kN-m of energy, find the reduction in speed of the flywheel. What is the maximum rate at which rivets can be closed ? 10
- 8. The acceleration  $a$  of a slider block and its displacement are related by the expression  $a = k\sqrt{s}$  where  $k$  is a constant. The velocity  $v$  is in the direction of the displacement and the velocity and displacement are both zero when time  $t = 0$ . Calculate the displacement, velocity and acceleration as a function of time. 10

### (Compulsory Question)

- 9. (a) Define concurrent and coplanar forces.
- (b) State the law of parallelogram of forces.
- (c) State advantages and applications of truss.
- (d) What do you mean by cone of friction ?
- (e) Define Centroid and centre of gravity.