18C45

B. Tech. EXAMINATION, 2020

(Third Semester)

(C Scheme) (Main & Re-appear)

(CHE)

ME221C

ENGINEERING AND SOLID MECHANICS

Time : 2½ Hours]   [*Maximum Marks : 75*

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note :   Attempt *Four* questions in all. All questions carry equal marks.

(5)M-18C45   1

1. A particle moves along a horizontal path with a velocity of $v = \left(3t^2 - 6t\right)$ m/s, where t is the time in seconds. If it is initially located at the origin O, determine the distance travelled in 3.5 s and the particle's average velocity and average speed during the time interval.

2. At a given instant, a cylinder of radius r, has an angular velocity ω and angular acceleration α. Determine the velocity and acceleration of its centre G if the cylinder rolls without slipping. (Fig. 1)
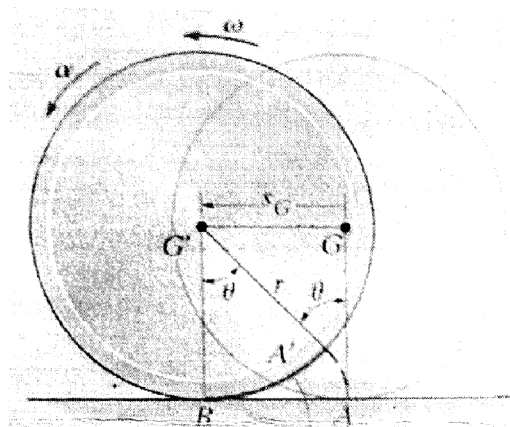

Fig. 1

3. A metallic cylinder of weight 1200 kg is kept within inclined planes, which are mutually perpendicular as shown in Fig. 2. Consider smooth contact surfaces, determine the forces of reaction.
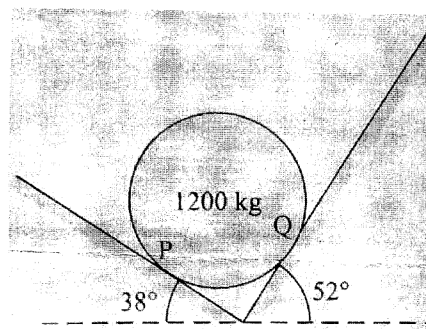

Fig. 2

4. Determine the axial forces in the central member BD of the truss shown in Fig. 3.
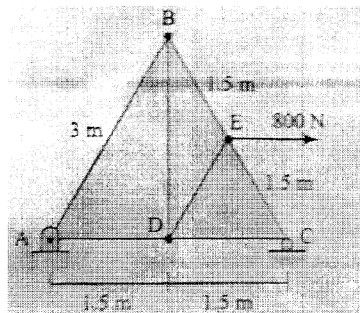

Fig. 3

5. A block of weight W_1 = 200 N rests on a horizontal surface and supports on the top of it another block of weight W_2 = 50 N. The block W_2 attached with vertical wall by a string, as shown in Fig. 4. Find the amount of horizontal force P, applied to the lower block necessary for impending slipping. The coefficient of friction for all contiguous surfaces is 0.3.
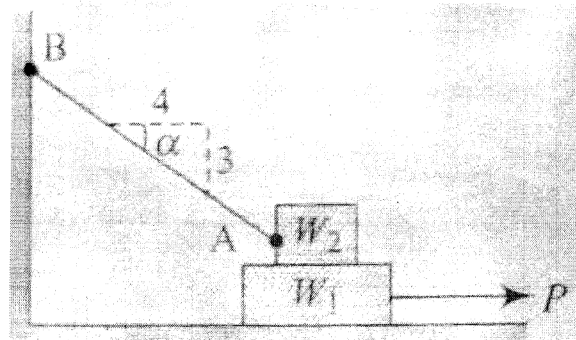

Fig. 4

6. Determine the coordinate of the centroid of the parabolic area as shown in Fig. 5. The equation of the parabola is $y = kx^n$.
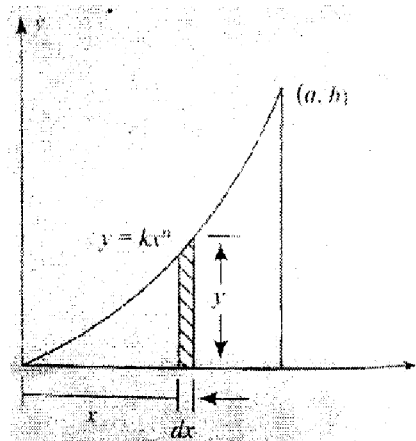
Fig. 5

7. The bar shown in Fig. 6, is tested in universal testing machine. It is observed that at a load of 40 kN the total extension of the bar is 0.285 mm. Determine the Young's Modulus of the material.
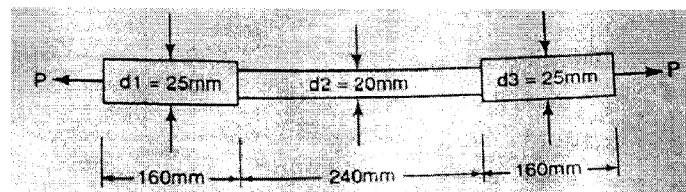

Fig. 6

8. Determine the diameter of solid shaft which will transmit 440 kW at 280 rpm. The angle of twist must not exceed one degree per metre length and the maximum torsional shear stress is to be limited to 40 N/mm^2. Assume G = 84 kN/mm^2.