

Ex/ME(M2)/PC/B/T/223/2023

BACHELOR OF MECHANICAL ENGINEERING EXAMINATION, 2023

(2nd Year, 2nd Semester)

ADVANCED ENGINEERING MECHANICS

Time : Three hours

Full Marks : 100

Answer any SIX questions

All questions carry equal marks

1. Fig Q1 shows a circular disk of 120 mm radius which rotates about z axis at the constant rate $\omega_z = 20 \frac{\text{rad}}{\text{s}}$ and the entire assembly rotates about the fixed x axis at the constant rate $\omega_x = 10 \frac{\text{rad}}{\text{s}}$. Calculate the magnitude of the velocity and acceleration of point B for the instant when $\theta = 30^\circ$.

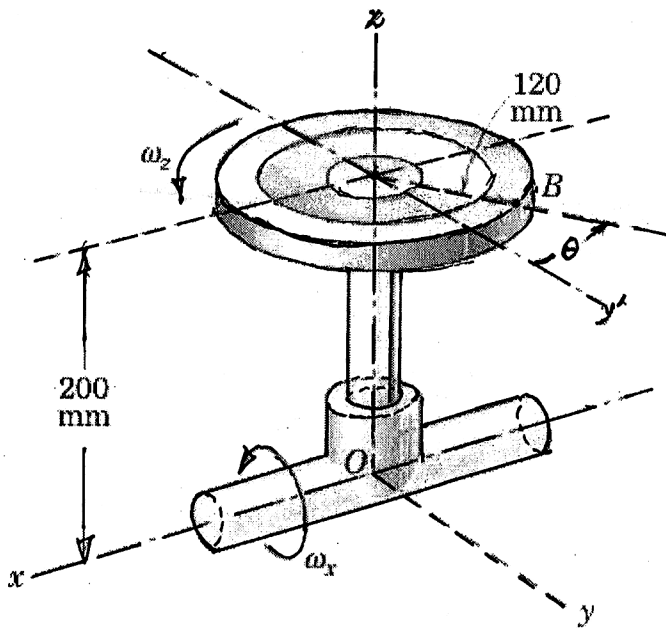


Figure Q1

[Turn over

2. Determine all inertia components of the uniform, slender rod of mass m and length L shown in Fig Q2.

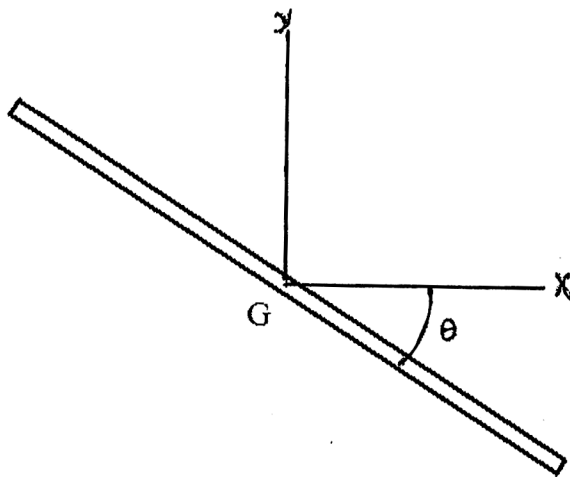


Figure Q2

3. Fig Q3 shows a uniform circular disc of mass m which has three components of angular velocity as shown. Determine the kinetic energy and angular momentum about point O .

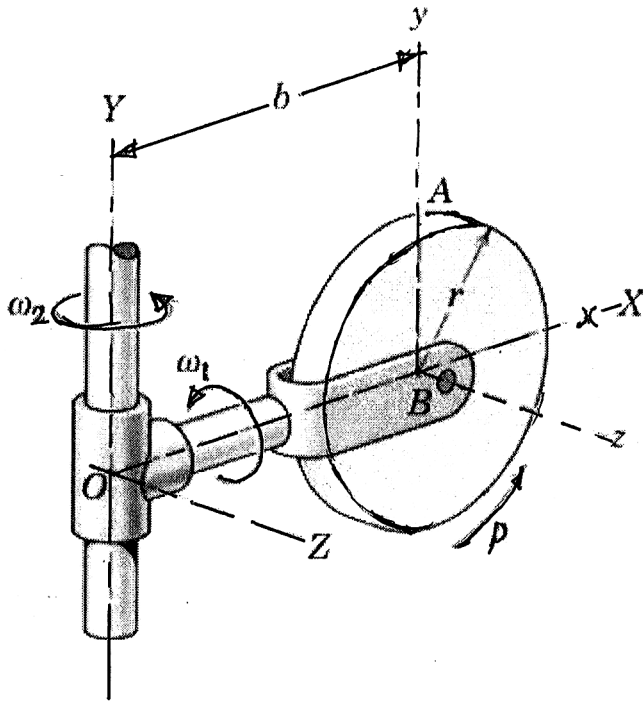


Figure Q3

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6. Fig Q6 shows a cantilever beam AB which is built-in at A and supported at B by a vertical steel tie-rod BC. Before the load P is applied at B, the tie rod is just taut but without initial tension. Find the tension in the tie rod after the load P is applied at B. The beam has flexural rigidity EI and the tie-rod has tensile rigidity AE.

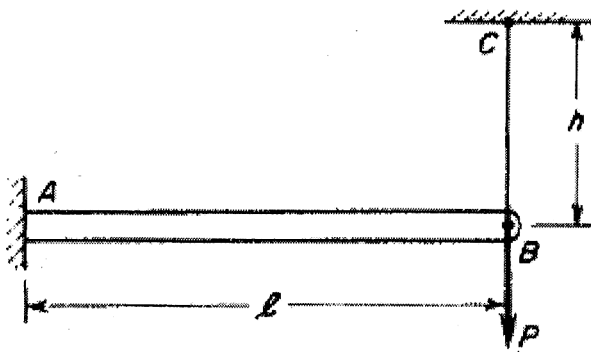


Figure Q6

7. Discuss the different types of strain rosettes and their use in experimental stress analysis.