

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: B. Arch
BRANCH: Architecture

SEMESTER : II
SESSION : SP/2023

SUBJECT: AR153 STATICS AND STRENGTH OF MATERIALS

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

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|--|-----|----|----|
| Q.1(a) Explain free body diagram of a force system with the help of a suitable example. | [5] | 1 | 2 |
| Q.1(b) Determine and locate the resultant of the two forces and one couple acting on the beam as shown in Figure 1. The beam is fixed at left. | [5] | 1 | 3 |

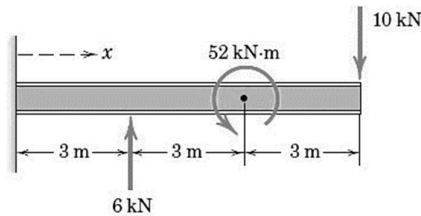


Figure 1

- | | | | |
|--|-----|---|---|
| Q.2(a) Explain Method of Joints and Method of Sections used to analyze a truss problem. | [5] | 2 | 2 |
| Q.2(b) Calculate the force acting through the members AB, AC, and DC of the truss shown in Figure 2. Use method of sections. | [5] | 2 | 3 |

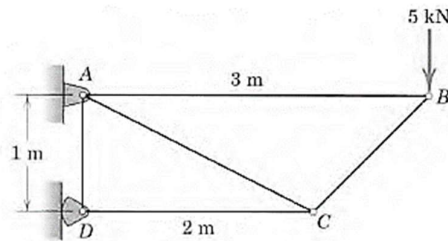


Figure 2

- | | | | |
|--|-----|---|---|
| Q.3(a) Explain parallel axis theorem of moment of inertia with the help of a suitable example. | [5] | 3 | 2 |
| Q.3(b) Determine the moment of inertia of the area under the parabola as shown in Figure 3 about the x-axis. | [5] | 3 | 3 |

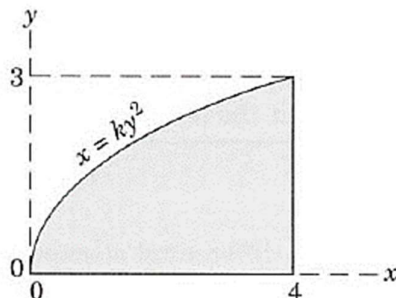


Figure 3

- Q.4(a) Draw the stress-strain diagram obtained from the tensile test of a typical ductile material and explain the important points. [5] 4 3,4
- Q.4(b) A prismatic bar of circular cross section is loaded axially by tensile force $P = 85 \text{ kN}$. [5] 4 3
 The bar has length $L = 3.0 \text{ m}$ and diameter $d = 30 \text{ mm}$. It is made of aluminum with modulus of elasticity $E = 70 \text{ GPa}$ and Poisson's ratio $\nu = \frac{1}{3}$. Calculate the axial elongation of the bar, the decrease in diameter, and the increase in volume of the bar.
- Q.5(a) Explain with example: Statically determinate and indeterminate beams. [5] 5 2
- Q.5(b) A simply supported beam AB carrying two concentrated loads of P at points C and D as shown in Figure 4. Draw the shear force and bending moment diagram of the beam. [5] 5 4
 The beam has length L .

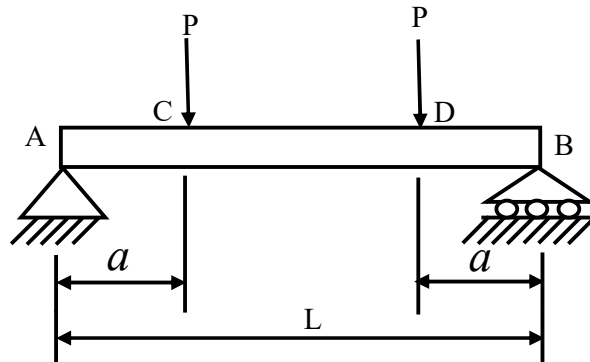


Figure 4

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