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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (Civil Engg.) II Year II-Semester Advanced Supplementary Examinations, June/July-2017

Strength of Materials-II

Time: 3 hours Max. Marks: 70

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. Calculate the deflection of cantilever beam of length 'L' subjected to uniformly distributed load w/meter over its entire span.
2. State the difference between moment-area method and conjugate beam method.
3. What do you mean by propped cantilever beam? What is the use of propping the beam?
4. What are the advantages and disadvantages of a fixed beam over a simply supported beam?
5. What is Clapeyron's theorem of three moments? How to apply this to a continuous beam with simply supported ends?
6. Define Shear Centre. What is the importance of shear centre?
7. Define the terms: Torsion, Torsional rigidity and Polar moment of Inertia.
8. What is a spring? Name the two important types of spring.
9. Define resilience, proof resilience and modulus of resilience.
10. Explain the assumptions made in Euler's column theory.

Part-B (5 × 10 = 50 Marks)
(All bits carry equal marks)

11. a) A cantilever of length 3m carries a point load of 20 kN at the free end and another load of 30 kN at its centre. If $E = 2 \times 10^5$ N/mm^2 and $I = 8.5 \times 10^8$ mm^4 for the material then determine the slope and deflection of the cantilever at the free end by moment area method.

    b) A Simply supported beam of length 6 m carries a point load 6 kN at a distance of 4 m from left end. If $E = 1.2 \times 10^5$ N/mm^2 and $I = 7 \times 10^8$ mm^4, determine the slope at the left support and deflection under the point load using conjugate beam method.

12. a) A cantilever of length 4 m carries a uniformly distributed load of 2 kN/m run over the whole length. The cantilever is propped rigidly at the free end. If $E = 1.8 \times 10^5$ N/mm^2 and $I = 3 \times 10^8$ mm^4, then determine i) Reaction at the rigid prop ii) The deflection at the centre of the cantilever iii) Magnitude and position of maximum deflection.

    b) A Fixed beam of 6 m span supports two point loads of 300 kN each at 2m from each end. Find the fixed end moments; draw the SF and BM diagrams and central deflection. $I = 9 \times 10^8$ mm^4, $E = 200$ GPa.

Contd. 2

13. a) Determine the position of shear centre for the unequal I-Section as shown in fig. 1.

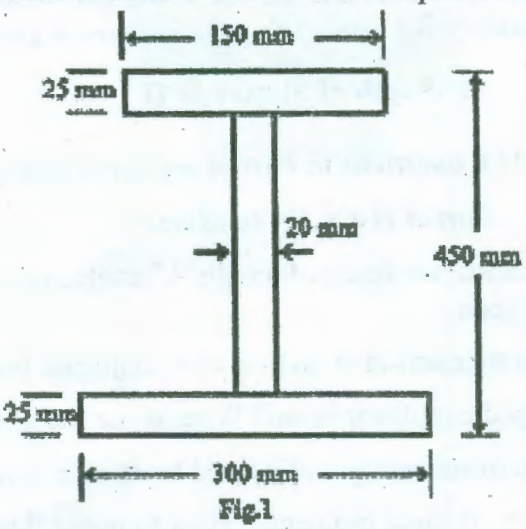

Fig.1

b) A continuous beams ABC covers two consecutive spans AB and BC of lengths 4m, 6m carrying uniformly distributed loads of 5kN/m and 10kN/m respectively. A and C are simply supported, Find the support moment at A, B and C. Draw SF and BM diagrams.

14. a) Derive the equation for deflection of a close-coiled helical spring due to axial load W.

b) Find the maximum torque transmitted by a hollow circular shaft of external diameter 300 mm and internal diameter 150 mm, if the shear stress is not to exceed 40 N/mm^2.

15. a) A load of 100 N falls through a height of 30 mm onto a collar rigidly attached to the lower end of a vertical bar 2 m long of 200 mm^2 cross-sectional area. The upper end of the vertical bar is fixed. Determine i) Maximum instantaneous stress induced in vertical bar, ii) Maximum instantaneous elongation iii) Strain energy stored in the vertical rod. E = 200GPa.

b) The external and internal diameters of a hollow cast iron column are 50 mm and 40 mm respectively. If the length of this column is 2 m and both of its ends are fixed. Determine the crippling load using Rankine's formula. Take the values of crushing stress as 550 N/mm^2 and $\alpha = 1/1600$ in Rankine's formula.

16. a) Calculate the maximum deflection of simply supported beam of length L with uniformly distributed load w/m run over left half of the beam using double integration method.

b) A fixed beam AB of length 6 m carries a uniformly distributed load of 3 kN/m over the right half of the span together with a point load of 4 kN at a distance of 4.5 m from the right end. Determine fixing end moments and the support reactions.

17. Write short notes on any **two** of the following:

a) Importance of Shear centre

b) Torsional rigidity

c) State theorem of reciprocal deflections.

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