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Question Paper Code : 73249

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Fourth Semester

Civil Engineering

CE 2252/CE 43/080100019/10111 CE 403 — STRENGTH OF MATERIALS

(Regulations 2008/2010)

(Common to 10111 CE 403 — Strength of Materials for B.E. (Part-Time) Second Semester – Civil Engineering – Regulations 2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is strain energy?

2. State Castigliano's theorem.

3. Define "indeterminate beams".

4. What are continuous beams?

5. Write the difference between long and short columns.

6. What is hoop stress?

7. Define dilation rate.

8. What are residual stresses?

9. Distinguish between fatigue and fracture.

10. Symmetrical and unsymmetrical sections- Explain.

PART B — (5 × 16 = 80 marks)

11. (a) Find the shear strain energy of the simply supported beam subjected to a concentrated load at the centre shown in Fig. 1. (Assume the cross section of the beam as rectangle).

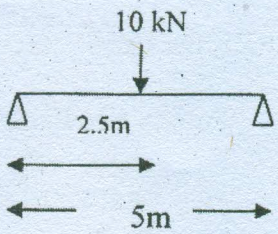

Fig. 1

Or

(b) A cantilever has a quadratal shape with a radius of curvature of R units. It carries a vertical load P at its free end A while its other end B is fixed. Assuming uniform flexural rigidity of the cantilever find the value of the vertical and horizontal deflection of the free end A.

12. (a) A cantilever beam carries a uniformly distributed load of intensity w_0. The beam is propped up at the free end by an unyielding support. Compute the reactions and maximum moment on the cantilever beam.

Or

(b) A continuous beam ABC is fixed at support A and simple supported at supports B and C. AB = BC = 5m. A udl of 10 kN/m acts on the entire beam. A point load of intensity 20 kN acts on span AB at 2 m from support A. Draw the shear force and bending moment diagrams.

13. (a) A hollow circular short column of outside diameter 300 mm and thickness 10 mm carries a load of 1000 kN. Determine the eccentricity along a diameter as which the load can be placed if the permissible stresses are 150 N/mm^2 in compression and 80N/mm^2 in tension.

Or

(b) A closed thick cylindrical shell has an internal diameter of 420 mm and an external diameter of 520 mm. It is 1.5 m long and is subjected to an internal pressure of 8 MPa, Plot the distribution of radial and hoop stresses across the thickness. Determine the change in internal volume and thickness. E = 200 GPa and $\mu = 0.3$.

14. (a) A state of strain is defined by $\varepsilon_x = 400\times10^{-6}$, $\varepsilon_y = -200\times10^{-6}$ and $Y_{xy} = 400\times10^{-6}$. If E = 200 GPa and $\mu = 0.3$, determine the principal stresses and the maximum shear stress.

Or

(b) A thin walled cylindrical pressure vessel of 150 mm mean diameter is subjected to a twisting moment of 1 kNm with an internal pressure of 3 MPa. If the allowable working stress in tension is 150 N/mm^2 determine the wall thickness of the vessel using the following theories Take $\mu = 0.3$

(i) Maximum normal stress theory

(ii) Maximum principal strain theory.

15. (a) An angle section $100\times80\times10$ mm, is used as a beam over a span of 5 m. If the permissible stress is 100 MPa, find the uniformly distributed load the beam can carry. The load passes through the shear centre.

Or

(b) A curved bar of rectangular section 60 mm × 30 mm is subjected to a bending moment of 600 Nm. Find the maximum stresses in the section. The mean radius of curvature is 100 mm.
