d) Derive an expression for the Euler's crippling load for a long column with both ends is fixed.   7

OR

A hollow mild steel tube 6 meter long 4cm internal diameter and 6 mm thick is used as a strut with both ends hinged. Find the crippling load. Take $E = 2 \times 10^5$ N/mm^2.   7

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Roll No ....

CE/FT - 303

B.E. III Semester

Examination, June 2014

Strength of Materials

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

UNIT – I

1. a) Define the terms principal planes and principal stresses.   2

b) Define the term obliquity.   2

c) State Hooke's Law.   3

d) Derive an expression for Young's modulus in terms of bulk modulus and Poisson's ratio.   7

OR

Find the diameter of a circular bar which is subjected to an axial pull of 160kN, if the maximum allowable shear stress on any section is 65 N/mm².   7

UNIT – II

2. a) What do you mean by pure bending?   2

   b) What do you understand by moment of resistance?   2

   c) What is the use of conjugate beam method over other methods?   3

   d) A rectangular beam 200mm deep and 300mm wide is simply supported over a span of 8 meter. What uniformly distributed load per meter the beam may carry, if the bending stress is not to exceed 120 N/mm².   7

OR

Prove that the maximum shear stress in a circulars section of a beam is 4/3 times the average shears tress.   7

UNIT – III

3. a) Define the term polar moment of inertia.   2

   b) What is a spring? Name the two important types of spring.   2

   c) What do you mean by 'strength of a shaft'?   3

   d) Determine the maximum strain energy stored in a solid shaft of diameter 10cm and of length 1.25 meter, if the maximum allowable shear stress is 50 N/mm². Take $C = 8 \times 10^4$ N/mm².   7

OR

A cylinder of thickness 1.5cm has to withstand maximum internal pressure of 1.5 N/mm². If the ultimate tensile stress in the material of the cylinder is 300 N/mm², factor of safety 3.0 and joint efficiency 80%, determine the diameter of the cylinder.   7

UNIT – IV

4. a) Write down the Winkler - Bach formula.   2

   b) Define principal moment of inertia.   2

   c) What are the assumptions made in the derivation of stress in a curved bar.   3

   d) Find an expression for h^2 for the circular section.   7

OR

Determine the position of neutral axis, when a curved beam of circular section of diameter 100mm is subjected to pure bending moment of 11.5 kN-m. The radius of curvature is 100mm.   7

UNIT – V

5. a) Define the term crippling load.   2

   b) What is equivalent length of a column?   2

   c) What do you mean by end conditions of a column?   3