OR

Two closed coiled helical spring are connected in parallel to take a load of 1500N. Both spring have 16 coils and are made of equal wire diameter of 15mm.their mean coils diameter of 60mm and 80mm respectively. Find the load sheared by the two spring and the maximum shear stress induced in them. also find the deflection in the equivalent spring. take G = 80KN/m²m for both springs.

UNIT-V

5. a) Write down the types of theories of failure? 2

   b) Define slenderness ration and buckling load? 2

   c) Write down the assumption of Euler theory for long columns? 3

   d) A circular shaft of 80mm diameter is subjected to combined bending and twisting moment the bending moment being four times of the twisting moment. Find the allowable twisting moment according to

      i) Maximum principal stress theory.

      ii) Maximum shear stress theory.

      iii) Distortion energy theory.

      Given the stress at the elastic limit is 4N/mm² and FOS = 3. 7

OR

Derive an expression for Euler's buckling load for a long column of length *l* when one end is fixed and other end pinned or hinged.

******

Roll No .....

AU/IP/IEM/ME/AE/PR - 303

B.E. III Semester

Examination, June 2014

Strength And Mechanics 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) Write the properties of engineering materials fatigue and creep? 2

   b) Define the stress - strain curve for ductile materials? 2

   c) Derive the relation between young's modulus. Bulk modulus and modulus of rigidity? 3

d) A steel tie rod 500mm in diameter and 2.5m long is subjected to a pull of 100KN. To what length the rod should be bored centrally, so that the total extension will increase by 15% under the same pull. The bore being 25mm diameter take E = 200 GN/m². 7

OR

A 2m steel bar of diameter 15mm is subjected to an axial pull of 50KN. Calculate the change in length, diameter and volume of the bar . if the passion ratio is 0.25. take young modulus E = 200 KN/mm².

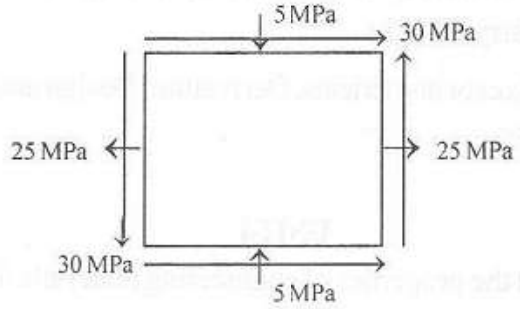
UNIT-II

2. a) Write down the properties of Mohr's circle? 2

b) Define principal stresses and principal planes? 2

c) For the plane stress condition $\sigma_x = 25MP_a\ (tensile)$, $\sigma_y = 5MP_a\ (Comp^n)$, $\tau_{xy} = 30MP_a$. Find the following

(i) Principal stresses (ii) Maximum shear stress 3



d) A thin spherical copper shell of diameter 300mm and thickness 2mm is full of water at atmospheric pressure. Find how much internal pressure will be increased by pumping $25\times10^{-6}m^3$ of water. Ec=100GN/m². Bulk modulus of water K = 2.3GN/m². Passion ratio = 0.28. 7

OR

Derive an expression for Mohr's circle of stresses?

UNIT-III

3. a) Define shear force and Bending moment? 2

b) Define strain energy and Resilience? 2

c) Define type's of beam with diagram? 3

d) What is moment area method? Where is it conveniently used? Find the slope and deflection of a simply supported beam carrying paint load? 7

OR

A simply supported beam ABC of constant flexural rigidity is subjected to a concentrated load of 300KN at B. Compute

i) Slope at A

ii) Slope and deflection at B

iii) Maximum deflection

Given AB = 4 meter and BC = 2 meter.

UNIT-IV

4. a) Define spiral spring and laminated spring? 2

b) Derive the expression for equivalent stiffness when two springs are connected in series? 2

c) Derive the expression for torsion equation $\frac{\sigma\theta}{l} = \frac{T}{J_p} = \frac{\tau}{R}$ (Where symbol has usual meaning). 3

d) A hallow shaft is to transmit 300KW at 80 rpm. If the shear stress is not to exceed 60MN/m² and internal diameter is 0.6 of external diameter. Find the external dia and internal diameter assuming that the maximum torque is 1.4 times of the means. 7