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SF-6565

B. E. - II (Sem. IV) (Mechanical) Examination

May / June - 2011

Mechanics of Solids - II

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ B. E. - 2 (SEM. 4) (MECHANICAL)

Name of the Subject :

☛ MECHANICS OF SOLIDS - 2

☛ Subject Code No. : 6 5 6 5 ☛ Section No. (1, 2,.....) : NIL

Seat No. :

Student's Signature

(2) Write answers to all questions in single answer book.
(3) Figures to the right indicate full marks.
(4) Assume suitable data if necessary and mention them specifically.
(5) All dimensions are in mm whenever required.

1 (a) Answer the following : **10**

(i) Define pitch of rivet.

(ii) Which theory is suitable for ductile materials ?

(iii) _____ reveting is used for the structural units.

(iv) The circumferential stress in a hollow circular rotating disc is at _____.

(v) Write Unvin's formula giving the relation between the diameter and thickness of rivets with notations.

(vi) Strain energy theory was postulated by _____.

(vii) Draw stress distribution diagram of solid disc and hollow disc.

(viii) _____ is the process of joining two pieces of metal by fusion.

(ix) In case of a solid rotating circular disc, the radial stress is maximum at _____.

(x) _____ theory of failure is suitable for brittle material.

(b) Write the advantages and disadvantages of welded connections. **10**

OR

(b) Attempt following : **10**

(i) Explain "maximum principle strain energy" theory in brief.

(ii) Explain the types of weld in detail.

2 For a rotating disc of diameter 1000 mm at 4000 rpm, determine the maximum and minimum radial and circumferential stress for following cases : **10**

(i) Disc with pin hole

(ii) Hollow disc of diameter 500 mm

Take f = 8000 kg/m^3; 1/m = 0.25.

3 Attempt any two : **20**

(i) A 40 mm shaft transmitting 400 N.m. torque and 200 N.m. maximum bending moment. The shaft is subjected to maximum tensile force of 15 kN. The material has yield stress 230 N/mm^2 and Poisson's ratio 0.30. Determine the F.O.S. of shaft by

(a) Maximum shear stress theory

(b) Maximum distortion energy theory

(c) Maximum principle strain theory.

(ii) A plate 40 mm wide carrying a load of 150 kN is to welded by four equal fillets to another plate as shown in figure no. 1 Find the necessary size of each fillet. Allow working stress of 70 MN/m^2 in side fillets and 100 MN/m^2 in end fillets.

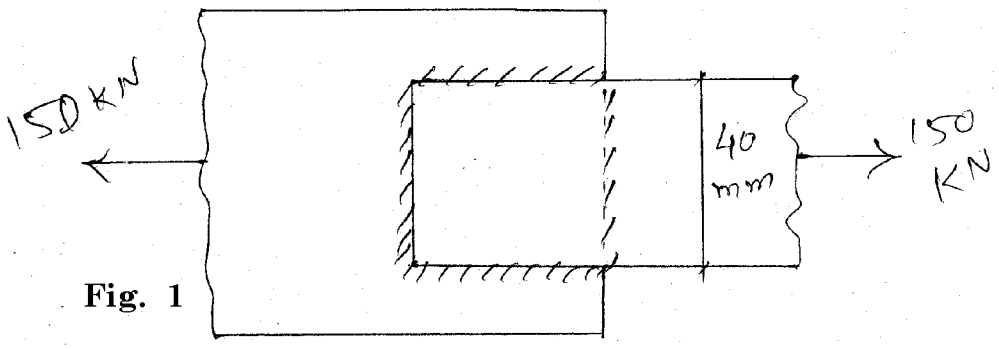

Fig. 1

(iii) A steel disc of uniform thickness and of 300 mm diameter is rotated about its axis at 1500 rpm. The density of the material is 7700 kg/m^3 and Possion's ratio is 0.30. Determine the variations of circumferential and radial stresses.

4 (a) Fill in the blanks : **5**

(i) The working stress are _____ the limit of proportionality for bars with large initial curvature.

(ii) If ratio of h/R_o _____ than it is taken as rod of small curvation.

(iii) Total strain energy stored in a body is called_____.

(iv) Castiglion's first theorem express_____.

(v) Stress peak is a point nearer to_____.

(b) Answer the following : (any two) **4**

(i) Write equation of beams with small initial curvature with neat sketch.

(ii) What is m in winkle batch formula.

(iii) Strain rossettes.

5 (a) Find the strain energy stored by the structure in fig. 2 and hence compute the vertical deflection of the end A. Assume that the section of the member is uniform. **6**

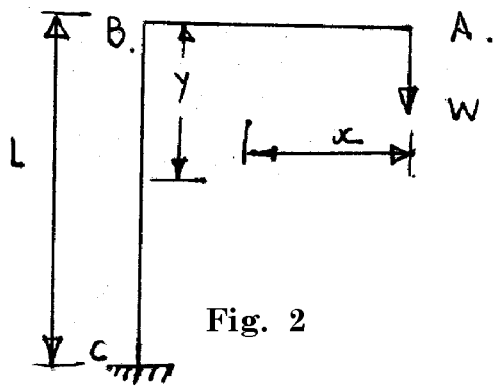

Fig. 2

(b) Fig. 3 shows a crane hook lifting a load 210 kN. A crane hook has a tri-angular cross-section with base 60 mm and height 60 mm with base towards the center of curvature. The inside edge of the section is at 120 mm. From the center of curvature and the load line is on the center of curvature. **12**

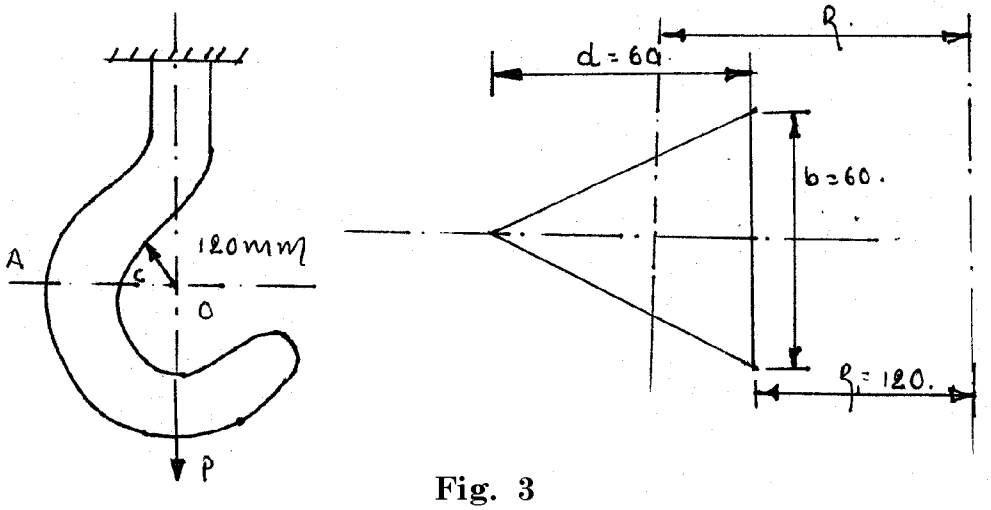

Fig. 3

OR

(b) (i) Explain Maxwell reciprocal theorem.

(ii) Write assumption in Winkel-Bach formula.

6 (a) Write short notes : (any three) **12**

(i) Ideal properties of strain gauge

(ii) Piston ring as a curved bar

(iii) Circular poloriscope

(iv) Castiglion's second theorem.

(b) For a rectangular strain rossette, the strains $\in_A, \in_B$ and $\in_C$ were recorded as +150μ, 500μ and 350μ, respectively. The value E = 200 kN/mm^2 and Poisson's ratio = 0.20. **11**

Calculate the principal strains, principal plane.