



**RM-6565**

**B. E. II (Sem. IV) (Mech.) Examination**

**April / May – 2010**

**Mechanics of Solids - II**

Time : 3 Hours]

[Total Marks : 100

**Instructions :**

(1)

नीचे दृशविले निशानीवाणी विगतो उत्तरवही पर अवश्य लपवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="text" value="B. E. 2 (Sem. 4) (Mech.)"/>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="text" value="Mechanics of Solids - 2"/>	<input type="text"/>
Subject Code No. : <input type="text" value="6"/> <input type="text" value="5"/> <input type="text" value="6"/> <input type="text" value="5"/>	<input type="text"/>
Section No. (1, 2,.....) : <input type="text" value="1&amp;2"/>	<input type="text"/>
	Student's Signature

- (2) Write answers to two **separate** answer books.  
(3) Assume suitable data whenever **necessary** and state them clearly.  
(4) Figures to the **right** indicates full marks.

**SECTION - I**

- 1 (a) Answer the following : 10
- (i) When the ends of the plates overlap each other, the joint is known as \_\_\_\_\_.
  - (ii) In case of solid rotating circular disc, the radial stress is maximum at \_\_\_\_\_.
  - (iii) Define "pitch" of rivet.
  - (iv) Strain energy theory was postulated by \_\_\_\_\_.
  - (v) Which theory of suitable for ductile materials?
  - (vi) The circumferential stress in a hollow circular rotating disc is at \_\_\_\_\_.
  - (vii) Efficiency of welded joint is \_\_\_\_\_ than that of riveted joints.
  - (viii) What is the statement of strain energy theory of failure?
  - (viii) Write the equations for maximum radial and circumferential stress in hollow disc with a pin hole at centre with notations.
  - (x) The ratio of maximum circumferential stress in a circular rotating disc having a very small hole to the maximum circumferential stress in solid circular rotating disc is \_\_\_\_\_.

- (b) A steel disc of uniform thickness and of diameter 300 mm is rotated about its axis at 1500 rpm. The density of material is  $7700 \text{ kg/m}^3$  and Poisson's ratio is 0.3. Determine the variation of circumferential and radial stresses. 10
- 2 (a) Write the advantages and disadvantages of welded joints. 6

OR

- (a) Write short note on : (any one) 6
- (i) Disc of uniform strength
- (ii) Shear strain energy theory.
- (b) A bracket is welded to the side of column and carries a vertical load of 100 kN as shown in Figure No. 1. Evaluate the maximum load per mm run on weld and also suggest the suitable size of weld. Maximum shear stress of weld is  $102.5 \text{ N/mm}^2$ . 12

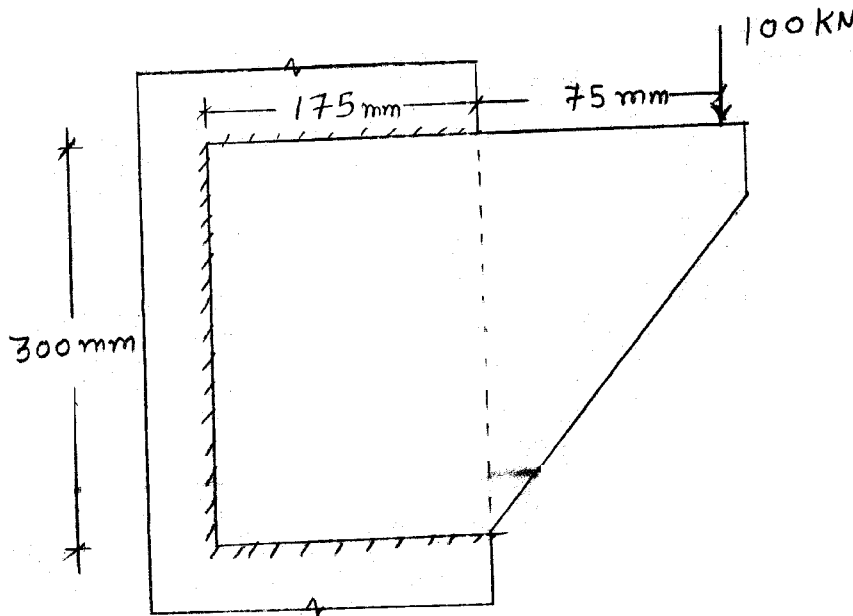


Fig. 1

- 3 A 40 mm shaft transmitting 400 N.m torque and 200 N.m maximum bending moment. The shaft is subjected to maximum axial tensile force of 15 kN. The material has yield stress  $230 \text{ N/mm}^2$  and Poisson's ratio 0.30. Determine the F.O.S. of the shaft by : 12
- (i) Maximum shear stress theory
- (ii) Maximum distortion energy theory
- (iii) Maximum principal strain theory.

OR

- 3 A long cylinder of 400 mm radius is rotating at 4000 rpm. 12  
The density of the materials is  $7800 \text{ kg/m}^3$ . and Poisson's ratio 0.30 :
- Calculate the maximum stress in the cylinder.
  - Draw the variations of the radial and circumferential stresses along the radius.

## SECTION - II

- 4 (a) Fill in the blanks : 5
- Bending moment (M) is a simple chain link for curved portion is given \_\_\_\_\_.
  - In winkler bach formula, if radius of curvature \_\_\_\_\_ moment will be \_\_\_\_\_.
  - when two or more strain gauges are combined then it is called as \_\_\_\_\_.
  - Bette's reciprocate theorem \_\_\_\_\_ express.
  - The stress at any point in case of curved bar subjected to bending moment given by \_\_\_\_\_.
- (b) Write assumption in winkwe bach formula. 5

OR

- (b) Explain fictionus load method with example. 5
- 5 (a) A portal frame ABCD is hinged at A and D has rigid 12  
joints B and C, the frame is loaded as shown in Fig. 2 using the method of minimum strain energy, analysis frame and plot the BM diagram.

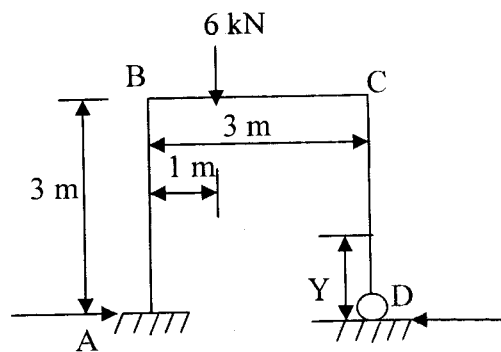


Fig. 2

- (b) Determine : (i) position of Neutral axis (ii) maximum and minimum stress when a curved beam of circular section of diameter 150 mm is subjected to pure bending moment of 11.8 kN mm. The radius of curvature is 100 mm. 12

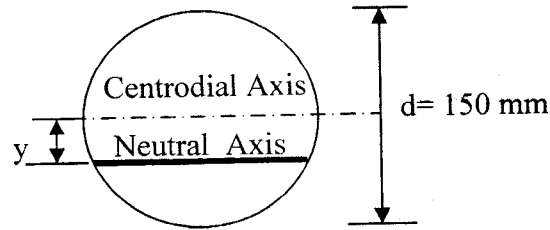


Fig. 3

- 6 (a) What is stress optic law? Different between a plane and circular polar scope. Reading arrangement and natural of frings obtains. 4

OR

- (a) Different types of shell with example. 4  
 (b) The three, strain reading of a rectangular rosette are  $500 \times 10^{-6}$ ,  $-150 \times 10^{-6}$  and  $200 \times 10^{-6}$ , for angle  $0^\circ$ ,  $60^\circ$  and  $120^\circ$  respectively if  $e = 200 \text{ kN/mm}^2$  and Possion's ratio = 0.25. Determine the principal direction also find shear. 12

OR

- (b) Write short note on any two : 12  
 (i) Folded plate  
 (ii) Castiglao's second theorem  
 (iii) Ideal properties of strain gauges.