



SF-6429

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

May / June - 2011

Strength of Materials - II

Time : 3 Hours]

[Total Marks : 100

Instructions :

(1)

नीचे दशावेक निशानीवाणी विगतो उत्तरवही पर अवश्य कपवी.  
Fillup strictly the details of signs on your answer book.

Name of the Examination :  
B. E. - 2 (SEM. 4) (CHEMICAL)

Name of the Subject :  
STRENGTH OF MATERIALS - 2

Subject Code No. : 6 4 2 9 Section No. (1, 2,.....) : NIL

Seat No. :

Student's Signature

(2) Figures to the right indicate full marks.

(3) Answer to all questions must be written in single answer book only.

(4) Assume suitable data wherever necessary and specifically mention them.

1 (a) Fill in the blanks : 10

(i) \_\_\_\_\_ theory of failure is suitable to predict the behaviour of ductile material. (Max. Principal Stress/Max. Shear Stress)

(ii) Castiglino's second theorem is also known as \_\_\_\_\_ (Principle of least work/Principle of virtual work)

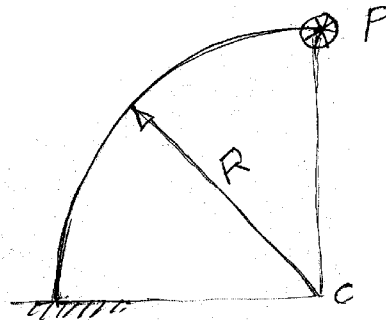
(iii) Castiglino's first theorem finds deflection under a point load in the direction of load. (true/false)

(iv) Nature of stress at the inner surface of crane hook is \_\_\_\_\_. (Tensile/compressive)

(iv) Ratio of stress developed due to sudden loading to gradual loading is \_\_\_\_\_ (2, 1/2)

(b) (i) Derive the expression for strain energy due to shear. 3

(ii) Determine the deflection under the load P. P 7 acts perpendicular to the plane of paper (fig.1)



SF-6429]

1

[Contd...

- 2 (a) Differentiate between curved beam and straight beam. 5

OR

- (a) Write critical stresses in a crane hook. Justify your answer with neat sketch. 5
- (b) Figure-2 shows a crane hook lifting a load of 150 kN. Determine the maximum compressive and tensile stress in the critical section of the crane hook. 10

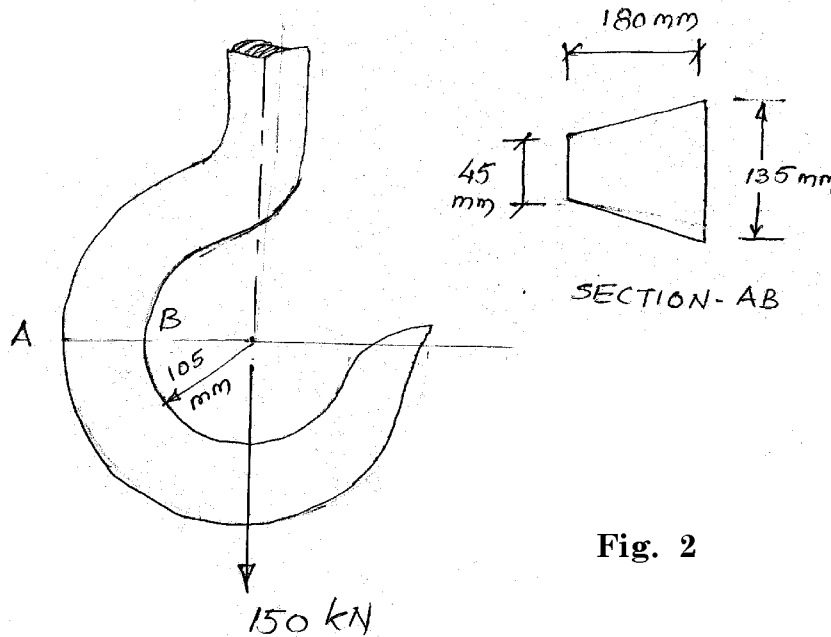


Fig. 2

- 3 (a) Discuss significance of theories of failure. 6
- (b) A shaft of solid circular section having diameter of 122 mm is designed with a suitable factor of safety to withstand a bending moment of 2 kN-m and a twisting moment of 4 kN-m. The yield strength of the material is taken as  $230 \text{ N/mm}^2$ , for the design using maximum principal stress theory. Redesign the shaft with same factor of safety using Energy of distortion theory. 9

OR

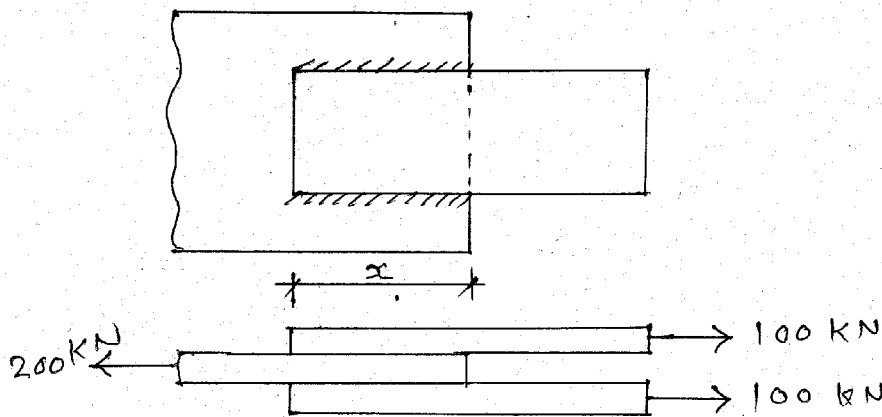
- (b) Write critical notes on any three : 9
- Thermo-elastic stress-strain relationship
  - Maxwell's Reciprocal theorem.
  - Stresses in a crane hook.
  - Differential equation of equilibrium.
  - Piston ring

- 4 (a) Fill in the blanks : 10
- The depth of weld in case of a butt weld is equal to \_\_\_\_\_. (thickness of weld, thickness of plate)
  - The throat thickness of the fillet weld is given by \_\_\_\_\_. ( $0.707t$ ,  $1.802 t$ )

- (iii) For tube arrays, strouhal number is based on \_\_\_\_\_ and \_\_\_\_\_ at the minimum cross section between tube. (Avg. velocity, tube dia)
- (iv) The efficiency of welded joint is \_\_\_\_\_ than that of riveted joints. (more, less)
- (v) The maximum circumferential stress in a disc with a pin hole at the centre is \_\_\_\_\_ the maximum circumferential stress in a solid disc. (one time, two times)
- (vi) In case of rotating disc of uniform strength, circumferential and radial stress are \_\_\_\_\_ to each other. (equal, unequal)
- (vii) \_\_\_\_\_ is the process of joining two piece of metal by fusion. (Reveting, welding)
- (viii) In case of solid circular rotating disc, the radial stress is maximum at \_\_\_\_\_. (Centre, outer edge)
- (ix) In eccentric weld connection, weld has to offer resistance against \_\_\_\_\_ and \_\_\_\_\_. (rotation, moment, translation)
- (x) The radial stress in hollow circular rotating disc is at \_\_\_\_\_. (Geometric mean radius, centre)

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

5 (a) Find the minimum lap required for the joint as shown in figure no. 1 if 6mm weld are used. Permissible shear stress in weld may be taken as  $102.5 \text{ N/mm}^2$ . 5



OR

- (a) Define following : 5
  - (i) Reynold's number 1
  - (ii) Differential equation of equilibrium. 2
  - (iii) Vortex Induced Vibration. 2

- (b) Figure 2 shows an arrangement to support a bracket plate. The load applied to the bracket plate is 100 kN. Find greatest resistance offered by weld per mm length if 6 mm fillet welds are used. Find the greatest intensity in the weld. 10

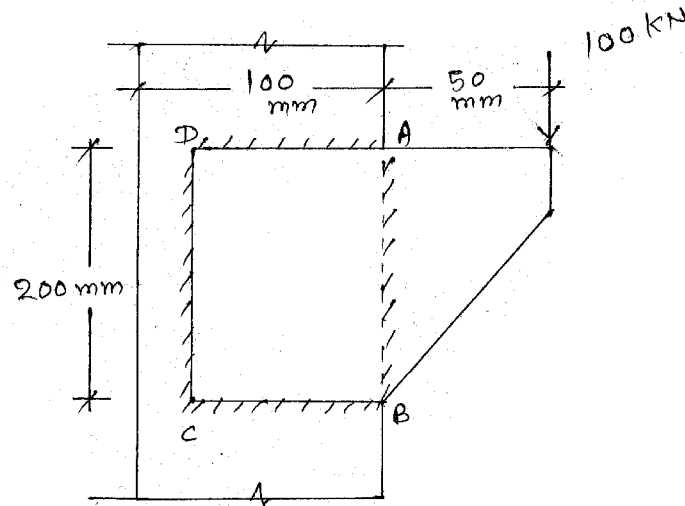


Fig. 2

OR

- (b) Find the maximum size of fillet weld required to connect the bracket plate to the column as shown in figure 3. Stress in weld is not to exceed  $102.5 \text{ N/mm}^2$ . 10

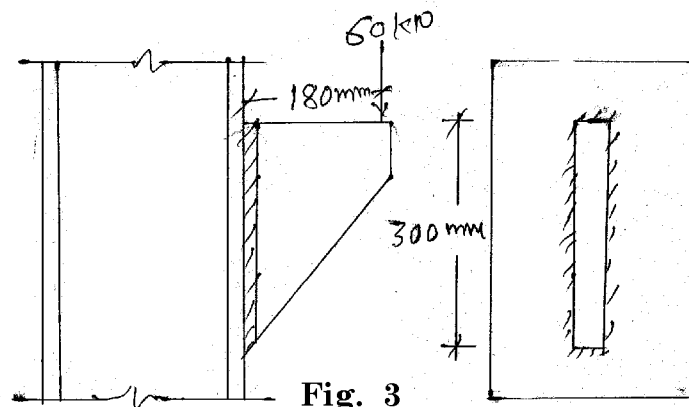


Fig. 3

- 6 A steel disc of uniform thickness and diameter 400 mm is rotating about its axis at 3000 rpm. The density of materials  $8000 \text{ kg/km}^3$ . and Poisson's ratio is 0.25. Determine the variation of circumferential and radial stresses. 15

OR

- 6 (a) Derive an equation for hoop stress in rotating ring. 7  
 (b) Derive an expression for the thickness of disc of uniform strength. 8