

17553

11819

4 Hours / 100 Marks

Seat No.

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- Instructions* –
- (1) All Questions are *Compulsory*.
 - (2) Illustrate your answers with neat sketches wherever necessary.
 - (3) Figures to the right indicate full marks.
 - (4) Assume suitable data, if necessary.
 - (5) Use of Non-programmable Electronic Pocket Calculator is permissible.
 - (6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
 - (7) Use of Steam tables, logarithmic, Mollier's chart is permitted.

Marks

- 1. Attempt any FIVE of the following: **20****
- a) What are the general design considerations in machine design?
 - b) What is keyway ? Explain the effect of keyways on strength of shaft.
 - c) Write any two advantages and two disadvantages of welded joints.
 - d) Define :
 - (i) Caulking
 - (ii) FulleringState the material used for rivets.

P.T.O.

- e) What is meant by bolts of uniform strength? Explain with neat sketches.
- f) List the stresses induced in pipes. Write their equations.
- g) State the assumptions made in analysis of simple frame.

2. Attempt any TWO of the following:

16

- a) An overhang crank with pin and shaft is shown in Figure No. 1. A tangential load of 15 kN acts on the crank pin. Determine the maximum principal stress and the maximum shear stress at the centre of the crankshaft bearing.

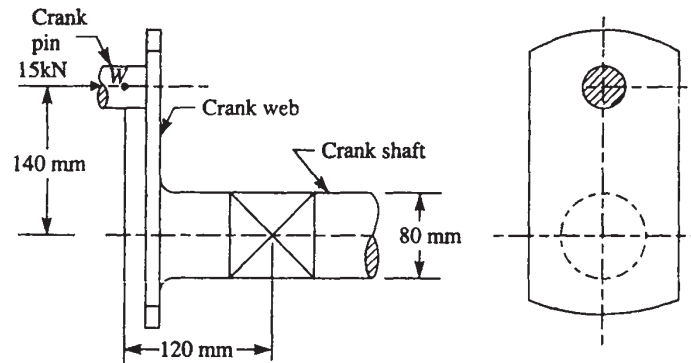


Fig. No. 1

- b) Write the design procedure of protected type flange coupling.
- c) (i) Explain the procedure for designing an axially loaded unsymmetrical welded section.
- (ii) A $200 \times 150 \times 10$ mm angle is to be welded to a steel plate by fillet welds as shown in Figure No. 2. If the angle is subjected to a static load of 200 kN. Find the length of weld at the top and bottom. The allowable shear stress for static loading may be taken as 75 MPa.

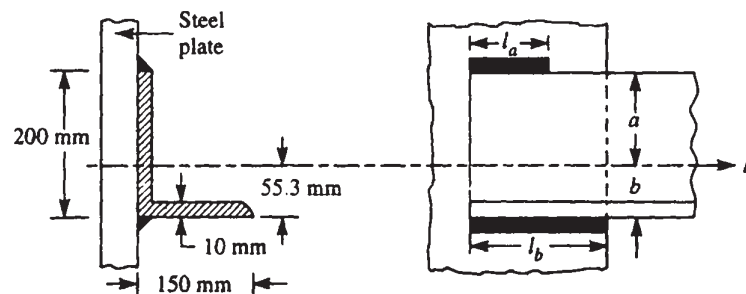


Fig. No. 2

3. Attempt any TWO of the following:

16

- Write the design procedures of circumferential lap joint for a boiler.
- A bracket as shown in Figure No. 3 is fixed to the wall by means of four bolts. Find the size of the bolts; if $\sigma_f = 70 \text{ N/mm}^2$ for bolt material.

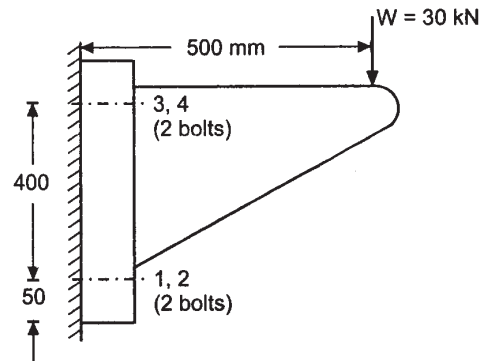


Fig. No. 3

- Design an oval flanged joint for a pipe having 50 mm bore. It is subjected to an internal fluid pressure of 7 N/mm^2 . The maximum tensile stress in the pipe material is not to exceed 20 MPa and in the bolts 60 MPa.

4. Attempt any TWO of the following:

16

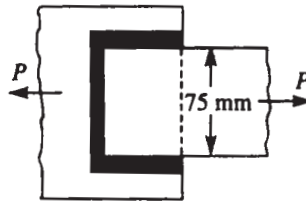
- Explain stepwise method of joints used to determine forces in the members of a frame.
- Define factor of safety. State the factors governing selection of factor of safety.
 - Define stress concentration. What are its causes?
- Design a shaft to transmit power from an electric motor to a lathe head stock through a pulley by means of a belt drive. The pulley weighs 200 N and is located at 300 mm from the centre of bearing. The diameter of the pulley is 200 mm and the maximum power transmitted is 1 KW at 120 r.p.m. The angle of lap of the belt is 180° and coefficient of friction between the belt and the pulley is 0.3. The shock and fatigue factors for bending and twisting are 1.5 and 2.0 respectively. The allowable shear stress in the shaft may be taken as 35 MPa.

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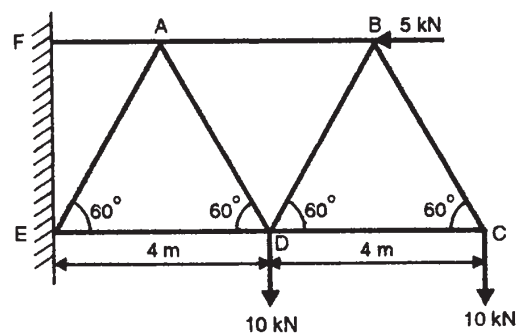
5. Attempt any TWO of the following:

16

- a) A 15 KW, 960 rpm motor has a mild steel shaft of 40 mm diameter and the extension being 75 mm. The permissible shear and crushing stresses for the mild steel key are 56 MPa and 112 MPa. Design the keyway in the motor shaft extension. Check the shear strength, of the key against the normal strength of the shaft.
- b) A plate of 75 mm wide and 12.5 mm thick is joined with another plate by a single transverse weld and a double parallel fillet weld as shown in Figure No. 4. The maximum tensile and shear stresses are 70 MPa and 56 MPa respectively. Find the length of each parallel fillet weld, if the joint is subjected to both static and fatigue loading.

Fig. No. 4

- c) A cantilever truss of span 8 m carries loads as shown in Figure No. 5. Find the forces in members AB, BD and CD of the truss by using the method of sections.

Fig. No. 5

6. Attempt any FOUR of the following:**16**

- a) Designate the following materials as per IS
 - (i) 30 Ni4Cr1
 - (ii) SG 400/12
 - b) Explain strength equations for transverse fillet welds with sketch.
 - c) Define perfect frame. State the methods of analysis of truss.
 - d) Why couplings are located near the bearings?
 - e) A double riveted lap joint with zig-zag riveting is to be designed for 13 mm thick plates. Assume $\sigma_t = 80$ MPa, $\tau = 60$ MPa, and $\sigma_c = 120$ MPa. Find the efficiency of the joint.
 - f) What are the various stresses induced in screw fasteners?
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