

17553

11718

4 Hours / 100 Marks

Seat No.

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- Instructions* –
- (1) All Questions are *Compulsory*.
 - (2) Answer each next main Question on new page.
 - (3) Illustrate your answers with neat sketches wherever necessary.
 - (4) Figures to the right indicate full marks.
 - (5) Assume suitable data, if necessary.
 - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
 - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

- 1. Attempt any FIVE of the following:** **20**
- a) Define factor of safety. State the factors governing selection of factors of safety.
 - b) Designate the following materials as per IS
 - (i) FG 300
 - (ii) 40 Cr 4
 - c) For a square key equally strong in shearing and crushing. Prove that crushing stress is twice the shear stress.
 - d) Write the advantages and disadvantages of welded joints.
 - e) List the various types of rivet heads. Draw neat sketches of any two.
 - f) Explain Bolts of uniform strength with neat sketches.
 - g) What is perfect frame? Explain.

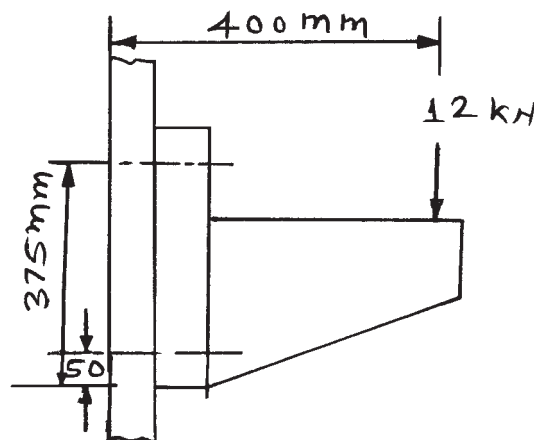
P.T.O.

2. Attempt any TWO of the following:**16**

- What is stress concentration? What are its causes? Also state its remedies to avoid it.
- Write the design procedure of protected type flange coupling.
- A plate of 80 mm wide and 10 mm thick is joined with another plate by a single transverse weld and double parallel fillet welds. The maximum tensile and shear stresses are 70 N/mm^2 and 50 N/mm^2 respectively. Find the length of each parallel fillet if the joint is subjected to static load of 60 kN.

3. Attempt any TWO of the following:**16**

- Write the design procedure of longitudinal butt joint for a boiler.
- For supporting the travelling crane in a workshop, the brackets are fixed on steel columns as shown in Figure No.1. The maximum load that comes on the bracket is 12 kN acting vertically at a distance of 400 mm from the face of the column. The vertical face of the bracket is secured to a column by four bolts, in two rows (two in each row) at a distance of 50 mm from the lower edge of the bracket. Determine the size of the bolts if the permissible value of the tensile stress for the bolt material is 84 MPa and depth of arm of the bracket, $b = 250 \text{ mm}$.

**Fig. No. 1**

- c) Design on oval flanged pipe 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

- a) (i) Explain the phenomenon of creep with neat sketch.
 (ii) Define endurance limit. Explain in brief S.N. curve.
- b) A solid circular shaft is subjected to a bending moment of 3000 Nm and a torque of 10000 N-m. The shaft is made of 45C8 steel having ultimate tensile stress of 700 MPa and ultimate shear stress of 500 MPa. Assuming a factor of safety as 6, determine the diameter of the shaft.
- c) Using method of sections, find the forces in the members BC, BE and FE of the frame as shown in Figure No. 2. Tabulate your results for magnitude and nature.

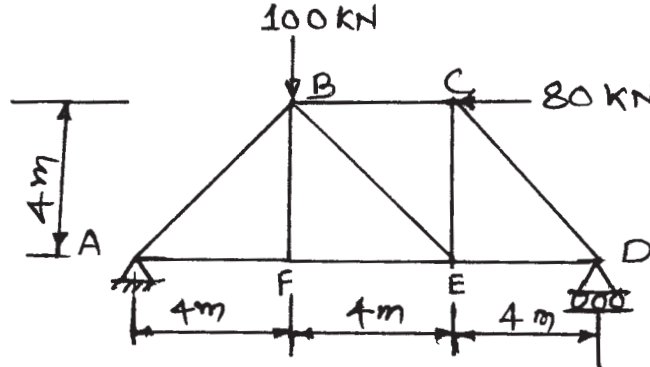


Fig. No. 2

5. Attempt any TWO of the following:

16

- Design a muff coupling which is used to connect two steel shafts transmitting 40 kw at 350 rpm. The material for the shafts and key in plain carbon steel for which allowable shear and crushing stresses may be taken as 40 MPa and 80 MPa respectively. The material for the muff in cast iron for which the allowable shear stress may be assumed as 15 MPa.
- Explain the procedure for designing an axially loaded unsymmetrical welded section with neat sketch.
- A cantilever truss is loaded as shown in Figure No. 3. Find the forces in the members by method of joints. Also calculate the reactions at D and E.

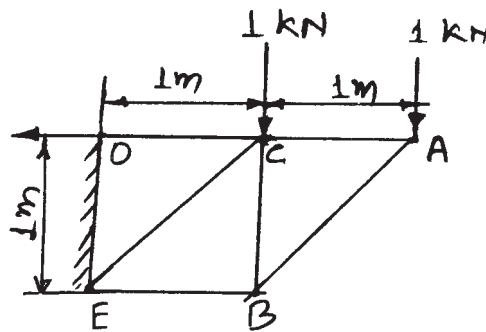


Fig. No. 3

6. Attempt any FOUR of the following:

16

- Explain the effect of keyways on strength of shaft.
- State the strength equation of double parallel fillet weld and single transverse filled weld with neat sketches.
- Explain Caulking and Fullering related to riveted joints.
- Enlist the stresses in screw fastenings.
- Write the design steps of design of pipes.
- What are the assumption in the analysis of frames?