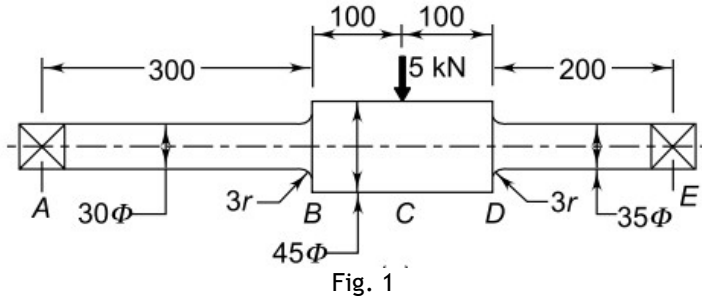


**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. **Machine Design Data hand book to be supplied to the candidates in the examination hall**

Q.1 Design a cotter joint required to withstand a load of 100 kN. The cotter joint is made up of material having following allowable stresses: [5] CO BL  
CO1 L2  
Allowable stress in tension = 55 MPa  
Allowable shear stress = 40 MPa  
Allowable Crushing stress = 70 Mpa

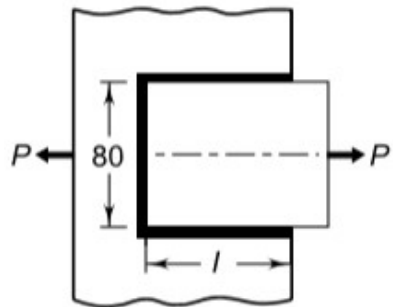
Q.2 A rotating shaft, subjected to a nonrotating force of 5 kN and simply supported between two bearings A and E is shown in Fig. 1. The shaft is machined from plain carbon steel 30C8 ( $S_{ut} = 500 \text{ N/mm}^2$ ) and the expected reliability is 90%. The equivalent notch radius at the fillet section can be taken as 3 mm. What is the life of the shaft? [5] CO1 L2



Q.3(a) What is standardization and what are the different standards used in mechanical engineering design? [2] CO1 L1

Q.3(b) Explain the Design process used in machine design with block diagram. [3] CO1 L1

Q.4 A steel plate, 80 mm wide and 10 mm thick, is joined to another steel plate by means of a single transverse and double parallel fillet welds, as shown in Fig. 2. The strength of the welded joint should be equal to the strength of the plates to be joined. The permissible tensile and shear stresses for the weld material and the plates are 100 and 70  $\text{N/mm}^2$  respectively. Find the length of each parallel fillet weld. Assume that the tensile force passes through the centre of gravity of three welds. [5] CO2 L2



- Q.5 A steel plate subjected to a force of 3 kN and fixed to a vertical channel by means of four identical bolts is shown in Fig. 3. The bolts are made of plain carbon steel 45C8 ( $S_{yt} = 380 \text{ N/mm}^2$ ) and the factor of safety is 2. Determine the diameter of the shank. [5] CO2 L2

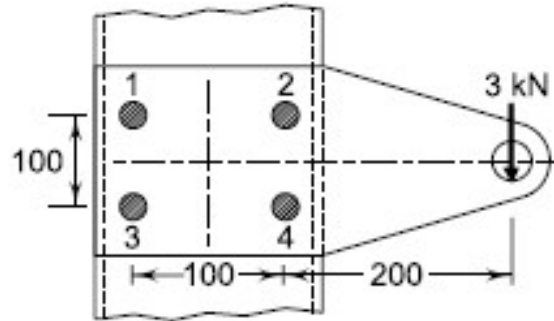


Fig. 3

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