Total No. of Questions : 4]

SEAT No. :

P-5072

[Total No. of Pages : 2

[6187]-475

T.E. (Mechanical/Sandwich/Mechanical Engineering) (Insem)

DESIGN OF MACHINE ELEMENTS

(2019 Pattern) (Semester - I) (302043)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates :

1) ***Answer Q.1 or Q.2, Q.3 or Q.4.***
2) ***Neat diagrams must be drawn wherever necessary***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary.***

Q1) a) Explain the following **[6]**

i) Factor of safety

ii) Service factor

iii) Eccentric loading

b) Two rods, made of plain carbon steel 40C8 (Syt = 380N/mm^2), are to be connected by means of a cotter joint. The diameter of each rod is 50 mm and the cotter is made from a steel plate of 15 mm thickness. Calculate the dimensions of the socket end making the following assumptions:

i) The yield strength in compression is twice of the tensile yield strength; and

ii) The yield strength in shear is 50% of the tensile yield strength.

The factor of safety is 6. **[9]**

OR

Q2) a) Explain the design procedure of Bell crank lever. **[9]**

b) The frame of a hydraulic press consisting of two identical steel plates is shown in Figure 1, The maximum force P acting on the frame is 20KN. The plates are made of steel 45C8 with tensile yield strength of 380N/mm^2.The FOS is 2.5. Determine Plate thickness. **[10]**

P.T.O.

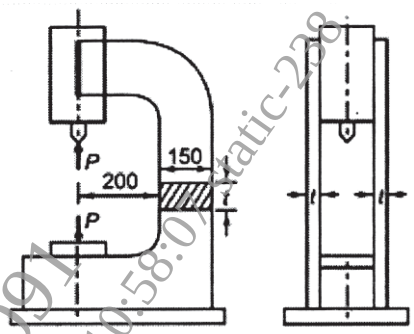

Figure 1

Q3) a) Explain the design procedure of hollow shaft based on torsional rigidity Derive necessary equations. **[6]**

b) A line shaft is driven by means of a motor placed vertically below it. The pulley on the line shaft is 1.5 meter in diameter and has belt tensions 5.4 kN and 1.8 kN on the tight side and slack side of the belt respectively. Both these tensions may be assumed to be vertical. If the pulley be overhang from the shaft, the distance of the center line of the pulley from the center line of the bearing being 400 mm, calculate the diameter of the shaft. Assuming maximum allowable shear stress of 42 MPa. **[9]**

OR

Q4) a) Classify the keys and explain it with neat diagram. Also prove that the compressive stress induced in a square key due to torque transmitted is twice the shear stress. **[6]**

b) A rigid coupling is used to transmit 50 kW power at 300 rpm. There are six bolts. The outer diameter of the flanges is 200 mm, while the recess diameter is 150 mm. The coefficient of friction between the flanges is 0.15. The bolts are made of steel 45C8 (S_{yt} = 380 N/mm^2) and the factor of safety is 3. Determine the diameter of the bolts. Assume that the bolts are fitted in large clearance holes. **[9]**

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