Total No. of Questions : 4]

SEAT No. :

PF252

[Total No. of Pages : 2

APR-26/SE/Insem-311
S.E. (Robotics and Automation) (Insem)
DESIGN OF MACHINE ELEMENTS
(2019 Pattern) (Semester - IV) (211510)

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

Instructions to the candidates:

Answer Q.1 or Q.2, Q.3 or Q.4, Use of scientific calculator is allowed. Figures to the right indicate full marks.

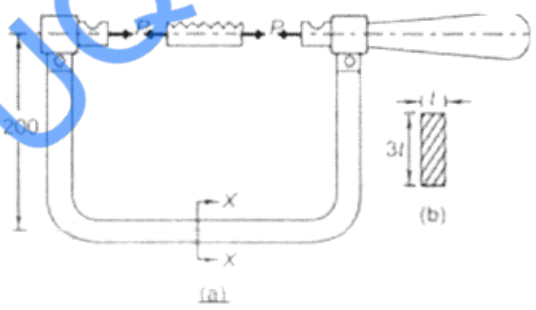
Q1) a) Draw the General Design Procedure used in Design of Machine Element. **[4]**

b) Explain the Role of factor of Safety in Machine Design. **[3]**

c) Two rods, made of plain carbon steel 40C8 (Syt = 380 N/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. **[8]**

OR

Q2) a) The frame of a hacksaw is shown in Fig The initial tension P in the blade should be 300 N. The frame is made of plain carbon steel 30C8 with a tensile yield strength of 400 N/mm^2 and the factor of safety is 2.5. The cross-section of the frame is rectangular with a ratio of depth to width as 3, as shown in Fig Determine the dimensions of the cross-section **[6]**



P.T.O.

b) It is required to design a knuckle joint to connect two circular rods subjected to an axial tensile force of 50 kN. The rods are co-axial and a small amount of angular movement between their axes is permissible. Design the joint and specify the dimensions of its components. Select suitable materials for the parts. **[9]**

Q3) a) Explain the classification of Coupling Along with example. **[4]**

b) A Transmission shaft is subjected to maximum torsional moment of 600Nm and a maximum bending moment of 1000 N.m.The loads are suddenly applied for which shock and fatigue factors in bending and torsion my be taken as 2.0 an 1.5 If the shaft material has ultimate tensile strength of 600Mpa and Yield strength of 380 MPa determine the shaft diameter considering key way effect as ASME code. **[5]**

c) Design a Clamp Coupling to transmit 3 kw at 120 rpm.The shaft and key are made of mild steel for which permissible shear stress is 40MPa The two halves are commenced by four bolts, and permissible tensile stress for the bolt is 70 MPa.The cofficent of friction between the sleeve and shaft surface may be taken as 0.3 **[6]**

OR

Q4) a) A bushed pin type flanged copying is used to transmit 20kw at 240 rpm 6 pins are used for the coupling at 180mm pitch circle diameter. The total length of the bush is 35 mm and the gap between the flanges is 3 mm. The permissible normal and shear stress for the pin material are 100 N/mm^2 respectively. Determine the pin diameter, which is in contact with thinner flange by bending and shear consideration consider the effect gap between the flanges. **[7]**

b) Write Down the Design Procedure for Flexible coupling. **[5]**

c) What is the difference between protected and unprotected rigid flange couplings? **[3]**