

Total No. of Questions : 4]

SEAT No. :

PA-10011

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[6008]270

S.E. (Robotics and Automation (RA)) (Insem)
DESIGN OF MACHINE ELEMENTS
(2019 Pattern) (Semester - II) (211510)

Time : 1 Hours]

[Max. Marks : 30

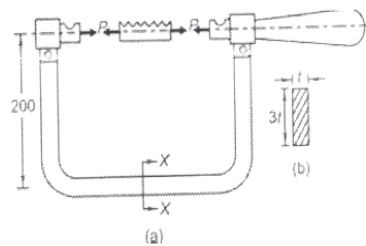
Instructions to the candidates:

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

- Q1)** a) Draw the General Design Procedure used in Machine Design. [3]
- b) Write a short note on Standards used in Machine Design. [3]
- c) Explain the Various traditional Methods along with example Design. [3]
- d) Two rods are connected by means of a cotter joint. The inside diameter of the socket and outside diameter of the socket collar are 50 and 100mm respectively. The rods are subjected to a tensile force of 50 kN. The cotter is made of steel 30C8 ($S_{yt} = 400 \text{ N/mm}^2$) and the factor of safety is 4. The width of the cotter is five times of thickness. Calculate: [6]
- i) Width and thickness of the cotter on the basis of shear failure; and
 - ii) Width and thickness of the cotter on the basis of bending failure.

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 50kN. 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 different Types of key along with Sketch. [4]

- b) What is the difference between protected and unprotected rigid flange couplings? [4]

- c) It is required to design a square key for fixing a gear on a shaft of 25mm diameter. The shaft is transmitting 15kW power at 720 rpm to the gear. The key is made of steel 50C4 ($S_{yt} = 460 \text{ N/mm}^2$) and the factor of safety is 3. For key material, the yield strength in compression can be assumed to be equal to the yield strength in tension. Determine the dimensions of the key. [7]

OR

Q4) a) A rigid coupling is used to transmit 50kW power at 300rpm. There are six bolts. The outer diameter of the flanges is 200mm, while the recess diameter is 150mm. The coefficient of friction between the flanges is 0.15. The bolts are made of steel 45C8 ($S_{yt} = 380 \text{ N/mm}^2$) and the factor of safety is 3. Determine the diameter of the bolts. Assume that the bolts are fitted in large clearance holes. [7]

- b) Explain Steps involved in Design of Bush Pin Type Coupling. [8]

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