

Roll No.

Total No. of Pages : 02

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B.Tech. (ME) (2012 Onwards) (Sem.-5)

**DESIGN OF MACHINE ELEMENTS-I**

Subject Code : BTME-501

M.Code : 70602

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTIONS TO CANDIDATES :**

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

**SECTION-A**

**1. Answer briefly :**

- a. Define 'Engineering Design'.
- b. What do you understand by 'embodiment design'?
- c. What human needs require considerations in a design problem?
- d. Write the difference between ductility and malleability.
- e. Define 'factor of safety'.
- f. Write the classification of joints.
- g. Write the equation to calculate the shear strength of solid and hollow shaft.
- h. List the functions of coupling.
- i. Define a lever.
- j. Write the classification of flange joints.

## SECTION-B

2. Discuss the BIS method of designation of steels.
3. Explain the phenomenon of 'stress concentration'.
4. A 50 mm diameter shaft is welded to a flat plate by fillet weld. Determine the size of the weld if the shaft is required to transmit a torque of 1300 Nm. The permissible working shear strength of the weld material is  $60 \text{ N/mm}^2$ .
5. What is the function of couplings and clutches? How does a coupling differ from a clutch?
6. Explain the procedure of designing a fulcrum pin.

## SECTION-C

7. A spherical pressure vessel with a 500 mm inner diameter is welded from steel plates of cold drawn C20 steel of ultimate strength  $440 \text{ N/mm}^2$ . The vessel is subjected to internal pressure which varies from  $2 \text{ N/mm}^2$  to  $6 \text{ N/mm}^2$ . If the reliability of the vessel is 95 % and the required factor of safety is 3, design the vessel for infinite life period.
8. Two plates of 6 mm thickness are to be joined by a double -riveted zig-zag lap joint, if the allowable strength of mild steel are  $\sigma_t = 100 \text{ N/mm}^2$ ,  $\sigma_s = 70 \text{ N/mm}^2$ ,  $\sigma_{cr} = 130 \text{ N/mm}^2$ .
9. Draw the fatigue curve and discuss its importance in the design of a machine element.

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**