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A – 2818

Reg. No. : .....

Name : .....

**Sixth Semester B.Tech. Degree Examination, May 2016  
(2008 Scheme)**

**Branch : Mechanical Engg.**

**08.605 : DESIGN OF MACHINE ELEMENTS – I**

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 1) Approved Design Data Hand Book Permitted.
  - 2) Assume missing data, if any **suitably**.
  - 3) Answer **all** questions from Part A and **one full** question from **each** module, from Part B.

**PART – A**

1. Discuss the different methods of reducing stress concentration in machine parts.
2. Explain the effect of thermal stresses in design.
3. Explain Goodman method for combination of stresses.
4. What are the advantages of preloading of bolts in a bolted joint ?
5. Why are square threads preferable to V threads for power transmission ?
6. Discuss the function of a coupling. Give two practical applications.
7. Explain surge in springs.
8. Explain Torsional rigidity and Lateral rigidity.
9. A hallow shaft has greater strength and stiffness than solid shaft of equal weight. Explain.
10. Differentiate between thin shell and thick shell with example.



**(10x4=40 Marks)**

**PART – B**

**Module – I**

11. A spherical vessel of a 500 mm inner diameter is subjected to an internal pressure which varies from 2 MPa to 6 MPa. The material of pressure vessel is cold drawn C20 steel having ultimate strength 450 MN/m<sup>2</sup> and yield strength 240 MN/m<sup>2</sup>. If the reliability of the vessel is 95% and the required factor of safety is 3. Find the thickness of pressure vessel for an infinite life period.

P.T.O.

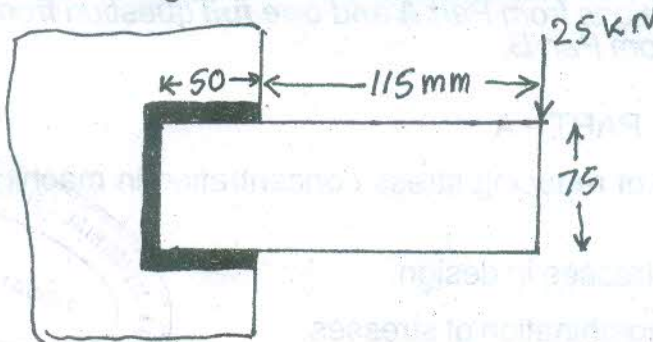




12. A bolt is subjected to a direct tensile load of 25 kN and a shear load of 18 kN. Suggest the suitable size of the bolt according to various theories of elastic failure, if the yield stress in simple tension is 390 MPa. Factor of safety = 3, Poisson's ratio = 0.25.

### Module - II

13. Design a cast iron flange coupling for joining two mild steel shafts transmitting 100 kW at 250 rpm. The angle of twist is not to exceed  $1^\circ$  in a length of 25 diameters. Take shear stress for shaft is  $40 \text{ MN/m}^2$  and shear stress for bolt is  $28 \text{ MN/m}^2$ .
14. Calculate the size of the weld required for an eccentrically loaded weld as shown in figure, the allowable stress in the weld is  $75 \text{ N/mm}^2$ .



### Module - III

15. a) A seamless steel pipe of 100 mm internal diameter, is subjected to internal pressure of 12 MPa. It is made of steel ( $\sigma_{ut} = 250 \text{ N/mm}^2$ ,  $\mu = 0.27$ ) and factor of safety 2.5. Determine the thickness of pipe. 6
- b) Design a valve spring for an automobile engine, when the valve is closed, the spring should produce a force of 45 N. When the valve is open, the spring should produce a force of 55 N. The spring must fit over the valve bush which has an outside diameter of 20 mm and must go inside a space of 35 mm. Valve lift is 7 mm. 14
16. A shaft is supported on two bearing 0.8 m apart. A pulley of 0.2 m diameter is mounted centrally on shaft which takes the power from vertical belt drive. The shaft also carries another pulley, which transmit the power to a machine, of 0.4 m diameter to the right hand side of the right bearing at a distance of 0.3 m from bearing. Both the pulleys contain flat belt at right angle to each other having tension ratio of 2.5 :1. If the maximum tension in the belt is limited to 3000 N, find the shaft diameter considering the pulleys are keyed to the shaft. Assume shear stress as  $40 \text{ MN/m}^2$ . (3×20=60 Marks)