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Reg. No. : .....

Name : .....

Sixth Semester B.Tech. Degree Examination, June 2015
(2008 Scheme)
08.605 : DESIGN OF MACHINE
Elements I (M)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **4** marks.

1. Explain :
   1) Saint Venant's theory
   2) Guest's theory.
2. Derive the expression for equivalent bending moment for a shaft subjected to combined twisting and bending moment.
3. What are the assumptions made in design of welded joints ?
4. Discuss on bolt of uniform strength giving examples of practical application of such bolts.
5. Differentiate between a cotter and a key.
6. Explain stress concentration, how can it be reduced ?
7. Derive Soderberg's equation for variable stresses and state its application to different types of loading.
8. Derive an expression for equivalent torque of a shaft.
9. Compare the stress distribution in a thick and thin walled pressure vessel.
10. Explain buckling of compression springs.

P.T.O.

PART – B

Answer **any one full** question from **each** Module. **Each** question carries **20** marks.

Module – I

11. A cold drawn steel rod of circular cross-section is subjected to variable bending moment of 500 Nm to 1000 Nm as the axial load varies from 4.5 kN to 13.5 kN. The maximum bending moment occurs at the same instant that the axial load is maximum. Find the diameter of the rod neglecting stress concentration. Take FS = 2, ultimate stress = 560 MN/m^2. Yield point stress = 476 MN/m^2.

12. A bolt is to be designed to carry a direct tensile load of 40 kN and a shear load of 20 kN with a factor of safety of 4. If the yield strength of the material is 380 N/mm^2. Determine the size of bolt using various theories of failure.

Module – II

13. A plate 150 mm wide is welded to a vertical plate to form a cantilever with a projecting length of 500 mm and an overlap between the plates as 100 mm. Fillet weld is done on the three sides. A vertical load of 30 kN is acting at the end of cantilever. If the allowable stress in the weld is 80 MN/m^2, determine the weld size.

14. Design a protective type of flange coupling of a steel shaft transmitting 25 kW at 300 rpm. Assume the following stresses.
    Shear stress for shaft, key and bolt = 40 N/mm^2
    Crashing stress for key and bolt = 85 N/mm^2
    Shear stress for cast iron = 14 N/mm^2.
    Draw a neat sketch of the coupling showing important dimensions.

Module – III

15. A shaft of an axial flow rotory compressor is subjected to a maximum torque of 2000 N-m and a maximum bending moment of 4000 N-m. The combined shear and fatigue factor is torsion and bending may be taken as 1.5 and 2 respectively. Determine the diameter of shaft if the shear stress in shaft should not exceed 50 MN/m^2. Also design a hollow shaft for the above compressor taking the diameter ratio of 0.5 for the hollow shaft.

16. A semi-elliptical laminated spring is required to support a central load of 400 N over an effective span of 915 mm. The width and thickness of each leaf are respectively 60 mm and 5 mm and permissible tensile stress in the material of the leaf is 475 MPa. The spring must have 2 full length leaves. Calculate the number of graduated leaves and deflection of spring under the load assuming the full length leaves are not pre-stressed. Assume $E = 200 \times 10^3$ MPa.
