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Reg. No. : .....

Name : .....

Sixth Semester B.Tech. Degree Examination, May 2013
(2008 Scheme)
08.605 : DESIGN OF MACHINE ELEMENTS I (M)

Time: 3 Hours Max. Marks : 100

Instructions : *1) Answer **all** questions from Part **A**.*
*2) Answer **one** question from **each** Module in Part **B**.*

PART – A

1. What is meant by notch sensitivity ?
2. Explain the effects of adding nickel, manganese and magnesium to cast iron.
3. Explain Goodman method for combination of stresses.
4. What are the methods of improving fatigue life ?
5. Explain what is meant by reinforcement in welding.
6. What are variable loads ? Sketch and explain.
7. Discuss about surge in springs.
8. How is shaft designed when it is subjected to twisting moment only ?
9. Explain Wahl's stress factor and state the significance in the design of helical springs.
10. What is meant by factor of safety ? What are the factors to be considered while selecting a factor of safety for a particular application ? **(10×4= 40 Marks)**

PART – B

Module – I

11. A stepped shaft with a reduction ratio of 1.2 is to have a fillet radius of 10% of the smaller diameter. The material of the shaft has notch sensitivity factor of 0.925, a shear stress of 160 N/mm^2 at yield and a shear stress of 120 N/mm^2 at edurance limit. Determine the diameter of shaft at the minimum cross section to sustain a twisting moment that fluctuates between 500 N.m (clockwise) and 800 N.m (anti-clockwise).

12. A mild steel shaft of 50 mm diameter is subjected to a bending moment of 'M' and a torque of 2200 N.m. If the yield point of steel in tension is 200 MPa, find the maximum value of bending moment without causing yielding of the shaft according to various theories of failure.

Module – II

13. Design a protective type of flange coupling of a steel shaft transmitting 15 kW at 200 rpm. Assume the following stresses shear stress for shaft, key and bolt = 40 N/ mm^2 crushing stress for key and bolt = 85 N / mm^2 shear stress for cast iron = 14 Nmm^2.

    Draw a neat sketch of the coupling showing important dimensions.

14. A cantilever in the form of a steel pipe of 100 mm internal diameter and 400 mm long is welded to the vertical side of a structure by an all round fillet weld. The thickness of the pipe is 8 mm. Determine the size of the weld if it is to have the same strength as that of pipe. What load can be supported at the end of the cantilever if the maximum permissible stress is 100 MPa ?

Module – III

15. A locomotive semielliptical laminated spring has an overall length of 1m and sustains a load of 80 kN at its centre. The spring has 3 full length leaves and 15 graduated leaves with a central band of 100 mm width. All the leaves are to be stressed to 400 MPa when fully loaded. The ratio of total spring depth to that of width is 2. E = 210 kN / mm^2.

Determine :

1) The thickness and width of the leaves.

2) The initial gap that should be provided between the full length and graduated leaves before the band load is applied.

3) The load exerted on the band after the spring is assembled.

16. A shaft is supported by two bearings 1m apart. A 600 mm diameter pulley is mounted at a distance of 300 mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having max. tension of 2.25 kN. Another pulley 400 mm diameter is placed 200 mm to the left of righthand bearing and is driven with the help of electric motor and belt, which is placed horizontally to the right. The angle of contact for bolk the pulley is 180° and co-efficient of friction is 0.24. Determine the suitable diameter for a solid shaft, allowing working stress of 63 N/mm^2 in tension and 42 N/mm^2 in shear for the material of shaft. Assume that the torque on one pulley is equal to that on the other pulley.

(3×20= 60 Marks)