C 41280 (Pages : 3) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, MAY 2013

AM /ME/PTME 09 603— MACHINE DESIGN—I

(2009 Admission onwards)

Time : Three Hours Maximum : 70 Marks

Assume data wherever necessary

Part A

Answer **all** *questions.*

1. Explain the effect of surface finish on Endurance limit.
2. How the fatigue failure in bolted joints be minimized ?
3. What is nipping in a leaf spring ?
4. The extension springs are in considerably less use than the compression springs. Why ?
5. Has a hollow shaft more or less resistance to bending than a solid shaft of the same diameter ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. A 50 mm diameter shaft is loaded statically in pure torque at a shear stress of 70 N/mm^2. If the yield stress is 435N/ mm^2, find the factor or safety by Guest's theory ?
7. Find the diameter of a steel rod 1.5 m long if it resists the impact of 2 kN dropped through a distance of 50 mm along the axis. The maximum stress is limited to 150 N/mm^2. E = 210 GPa.
8. Find the diameter of spigot and thickness of cotter for connecting two mild steels by means of a cotter joint for a pull of 30 kN. The maximum permissible stresses are 55 MPa in tension and 70 MPa in crushing.
9. A plate 100 mm wide and 10 mm thick is to be welded with another plate by means of transverse welds at the ends. If the plates are subjected to a load of 70 kN, find the size of the weld for static load. The permissible tensile stress should not exceed 70 MPa.
10. A machinery shaft is subjected to torsion only. The bearings are 2.4 m apart The shaft transmits 187.5 kW at 200 rev/min. If the allowable shear stress is 42 MPa, determine the shaft diameter for steady loading.

11. A shaft 80 mm diameter transmits power at maximum shear stress of 63 MPa. Find the length of a 20mm wide key required to mount a pulley on the shaft so that the stress in the key does not exceed 42 MPa.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

12. A cylindrical shaft made of steel of yield strength 700 MPa is subjected to static loads consisting of bending moment 10 kN-m and a torsional moment 30 kN-m. Determine the diameter of the shaft using two different theories of failure, and assuming a factor of safety of 2. Take E = 210 GPa and Poisson's ratio = 0.25.

Or

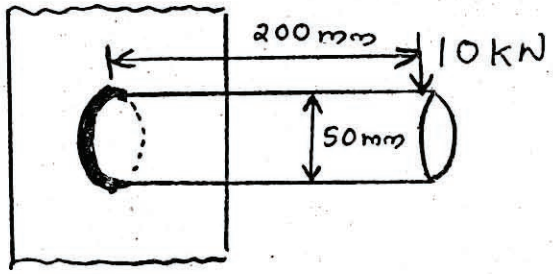
13. Briefly explain the system design cycle.

14. The cylinder head of a steam engine is subjected to a steam pressure of 0.7 N/mm^2. It is held in position by means of 12 bolts. A soft copper gasket is used to make the joint leak-proof. The effective diameter of cylinder is 300 mm. Find the size of the bolts so that the stress in the bolts is not to exceed 100 MPa.

Or

15. A knuckle joint required for a rod which has to withstand a total load of 100 kN. Design the joint if the safe working stresses both in tension and shear are 65N/mm^2.

16. A 50 mm diameter solid shaft is welded to a flat plate as shown below. If the size of the weld is 15 mm, find the normal and shear stress in the weld.



Or

17. A helical compression spring is subjected to a load which varies from 400 N to 1000N. The spring index is 6 and the compression of the spring at maximum load is 30 mm. Yield stress in shear is 770 MPa and endurance stress in shear is 350 MPa. Design the spring if the factor of safety is 1.25. Take G = 80 kN/mm^2.

18. The internal diameter of a hollow shaft is 2/3rd of its external diameter. Compare the strength and stiffness of the shaft with that of a solid shaft of the same material.

Or

19. A marine type flange coupling is required to transmit 2900 kW power at a speed of 100 rev/min. Flanges are connected by 8 taper bolts having an allowable shear stress of 60 N/mm^2. The material shaft and bolts used is same. Design the flange coupling.

(4 × 10 = 40 marks)