C 26793 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, MAY 2012

AM/ME 09 603—MACHINE DESIGN—I

(2009 admissions)

Time : Three Hours Maximum : 70 Marks

Assume data wherever necessary.

Part A

Answer all *questions.*
Each question carries 2 *marks.*

1. Define the term "creep".
2. Define self-locking screw.
3. How the surge in springs can be eliminated ?
4. What is the function of a key ?
5. Discuss the function of coupling.

(5 × 2 = 10 marks)

Part B

Answer any four *questions.*
Each question carries 5 *marks.*

6. The load on a bolt consists of an axial pull of 10 kN together with a transverse shear force of 5 kN. Find the diameter of bolt required according to maximum principle stress theory.
7. A medium force 0.225 mm. fit on a 75 mm. shaft requires a hole tolerance of 0.225 mm., shaft tolerance of 0.223 mm. and an average interference of 0.0375 mm. Determine the proper hole and shaft dimensions with the basic hole standard.
8. Two mild steel rods 40 mm. diameter are to be connected by a cotter joint. The thickness of the cotter is 12 mm. Calculate the diameter of spigot and outside diameter of socket, if the maximum permissible stresses are : 46 MPa in tension, 35 MPa in shear and 70 MPa in crushing.
9. An eye bolt is to be used for lifting a load of 60 kN. Find the nominal diameter of the bolt, if the tensile stress is not to exceed 100 MPa.
10. A gas engine valve spring is to have a mean diameter of 37.5 mm. The maximum load on it is 450 N with a corresponding deflection of 12.5 mm. Find the size of the wire, if the design shear stress is 300 N/mm.^{2}
11. A shaft 30 mm. diameter is transmitting power at a maximum shear stress of 80 MPa. If a pulley is connected to the shaft by means of a key, find the dimensions of the key so that the stress in the key is not to exceed 50 MPa and length of the key is 4 times the width.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

12. Calculate the fundamental deviation and tolerance and hence obtain the limits of size for the hole and shaft in the following fit : 60 mm, H_8f_7. The diameter steps are 50 mm. and 80 mm.

Or

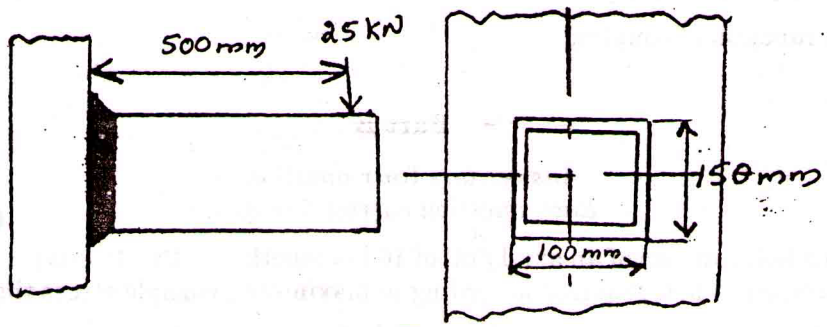
13. What is meant by stress concentration ? Illustrate how the stress concentration in a component can be reduced.

14. Two lengths of mild steel tie rod having width 200 mm. and thickness 12.5 mm. are to be connected by means of a butt joint with double cover plates. Design the joint if the permissible stresses are 80 MPa in tension, 65 MPa in shear and 160 MPa in crushing.

Or

15. Design a cotter joint to connect two mild steel rods for a pull of 30 kN. The maximum permissible stresses are 55 MPa in tension, 40 MPa in shear and 70 MPa in crushing.

16. A rectangular cross-sectional bar is welded to a support by means of fillet weld as shown below. Determine the size of the welds, if the permissible shear stress in the weld does not exceed 75 MPa.



Or

17. For a valve spring petrol engine, length of the spring when valve is open = 41 mm., length of the spring when valve is closed = 49 mm., spring load when valve is open = 360 N, spring load when valve is closed = 220 N, maximum inside diameter of spring = 25 mm. Design the spring for the maximum permissible shear stress of 400 N/mm.^{2} and G = 83 kN/mm.^{2}

18. A solid circular shaft is subjected to a bending moment of 3000 N-m and a torque of 1000 N-m. The shaft is made of steel having ultimate tensile stress of 700 MPa and an ultimate shear stress of 500 MPa. Assuming a factor of safety as 6, determine the diameter of the shaft.

Or

19. It is required to design a bushed pin type flexible coupling for connecting the motor and centrifugal pump shafts. Power to be transmitted is 18.5 kW at a speed of 1000 rev/min. The diameters of the motor and pump shafts are 50 mm. and 45 mm. respectively. Take the bearing pressure on the rubber bush as 0.35 N/mm.^{2} and the working shear stress in the material of the pins as 20 N/mm.^{2}

(4 × 10 = 40 marks)