C 61488 (Pages : 3) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, APRIL 2014

(2009 Scheme)

ME/PTME/AM 09 603—MACHINE DESIGN–I

(Regular/Supplementary/Improvement)

Time : Three Hours Maximum : 70 Marks

Part A

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

1. Define endurance limit.
2. Give advantages and disadvantages of riveted joints.
3. What are the applications of a cottered joint ?
4. What are the assumptions made in design of welded joints ?
5. Is a hollow shaft stronger *or* weaker than a solid shaft of the same weight ?

(5 × 2 = 10 marks)

Part B

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

6. A 75mm shaft rotates in a bearing. The tolerance for both shaft and bearing is 0.075mm and the required allowance is 0.1mm. Determine the dimensions of the shaft and the bearing bore with the basic hole standard.
7. An electric motor driven power screw moves a nut in a horizontal plane against a force of 75 kN at a speed of 300 mm / min. The screw has a single square thread of 6 mm pitch on a major diameter of 40 mm. The coefficient of friction at screw threads is 0.1. Estimate power of the motor.
8. A plate 120 mm wide and 12 mm thick is to be welded to another plate by means of parallel fillet welds and are subjected to a static load of 50kN. Find the length of weld if the permissible shear stress in the weld does not exceed 56MPa and joint is under fatigue loading.
9. The wire diameter of a tension spring is 2mm with a spring index of 6. The spring is assembled with a preload of 30N and it has 18 active coils. The permissible shear stress is 700MPa and modulus of rigidity is 80kN/mm^2. Determine the initial torsional shear stress in the wire and spring rate.

Turn over

10. A transmission shaft with keyways is subjected to a maximum torsional moment of 750Nm and a maximum bending moment of 1200Nm. The loads are suddenly applied, minor shocks are encountered and the allowable shear stress is 42MPa. Find the shaft diameter.

11. A belt pulley is fastened to a 75mm shaft, running at 200 rev/min, by means of a key, 18mm wide and 125mm long. The permissible stresses in the key are 55N/mm^2 in shear and 100N/mm^2 in crushing. Find the power transmitted by the key and width of the key.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

Each question carries 10 *marks.*

12. Briefly explain manufacturing considerations in design.

Or

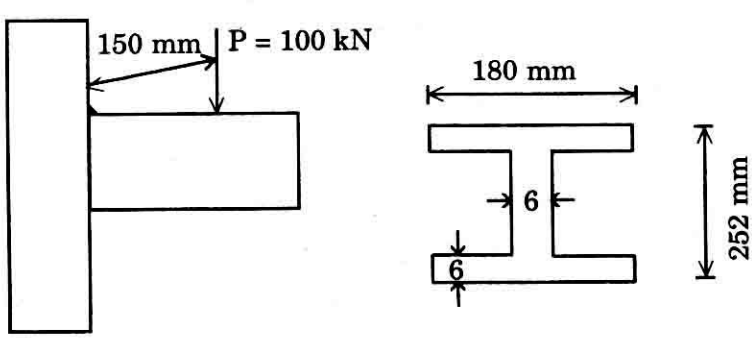
13. A steel connecting rod is to be subjected to a reverse axial loading of 180kN. Determine the required diameter of the rod, using factor of safety 2. Assume no column condition. σ_{ut} = 1050N/mm^2 and σ_{yp} = 894N/mm^2.

14. Design a cotter joint to support a load varying from 28kN in tension to 28kN in compression. The material for all components of joint is steel with allowable stresses in tension, compression and shear as 50 N/mm^2, 60 N/mm^2 and 35 N/mm^2 respectively.

Or

15. A double riveted lap joint with zig-zag riveting is to be designed for 13mm thick plates. Assume the permissible stresses is tension, shear and compression be 80MPa, 60MPa and 120MPa. Find the efficiency of the joint.

16. An I beam is welded all around as shown below. Determine the stresses in the fillets of weld if the load is 100 kN.



Or

17. Design a leaf spring for the following specifications : Total load = 140 kN ; Number of springs supporting the load = 4 ; Maximum number of leaves = 10 ; Span of the spring = 1000 mm ; Permissible deflection = 80 mm. Take Young's modulus, E = 200 kN/mm^2 and allowable stress in spring material as 600 MPa.

18. A line shaft is to transmit 30 kW at 160 r.p.m. It is driven by a motor placed directly under it by means of a belt running on a 1 m diamter pulley keyed to the end of the shaft. The tension in the tight side of the belt is 2.5 times that in the slack side and the centre of the pulley over-hangs 150 mm beyond the centre line of the end bearing. Determine the diameter of the shaft, if the allowable shear stress is 56 MPa and the pulley weighs 1600 N.

Or

19. It is required to design a flanged coupling for connecting the motor and centrifugal pump shafts. Power to be transmitted is 18 kW at a speed of 1000 rev/min. The allowable stress in the shaft is limited to 50 N/mm^2 and angle of twist is not to exceed 0.75 degrees in a length of 15 diameters. The allowable shear stress in the coupling bolts is 30 N/mm^2.

(4 × 10 = 40 marks)