Register Number:

B.E DEGREE EXAMINATIONS: MAY/JUNE 2013

Fifth Semester

MECHANICAL ENGINEERING

MEC114: Design of Machine Elements

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Factor of safety for brittle material is based on
   a) Yield point stress b) Ultimate stress
   c) Maximum shear stress d) None of these
2. Alloy of tin and copper is called
   a) Brass b) Bronze c) Duralumin d) Gun metal
3. In a marine type flange coupling, used to connect alloy steel shafts, the flanges are made of
   a) Cast iron b) Wrought iron
   c) Low carbon steel d) None of the above
4. Stress ratio for completely reversed stresses is
   a) 3 b) 4 c) 5 d) 6
5. Parallel Fillet welds (joints) are designed for
   a) Compressive strength b) Tensile strength
   c) Bending strength d) Shear strength
6. Designing of shaft is done on the basis of
   a) Strength b) Rigidity c) stiffness d) all
7. 305 bearing refers to
   a) Light series bearing with 10mm bore b) Medium series bearing with 25mm bore
   c) Medium series bearing with 20mm bore d) Heavy series bearing with 30mm bore
8. Starting friction is low in
   a) Hydrostatic lubrication b) Hydrodynamic lubrication
   c) Semi – fluid lubrication d) Boundary lubrication

9. Modulus of resilience is defined as the ratio of

a) Proof resilience / volume
b) Resilience / volume
c) Proof resilience / area
d) Resilience / area

10. The purpose of making a bolt of uniform strength is to make it

a) Weaker and heavier
b) Stronger and lighter
c) Weaker and lighter
d) Stronger and heavier

PART B (10 x 2 = 20 Marks)

11. A 25mm diameter shaft is supported in a journal bearing. The reaction at the bearing is 2KN. If the permissible pressure is 2N/mm2, determine the required length of the bearing.
12. What do you mean by curved beams?
13. What do you mean by solid flange coupling?
14. Determine the smallest size of a hole that can be punched in a 12mm thick steel plate; from the following permissible compressive stress in the punch = 1000 MPa, Ultimate shear stress of the plate = 350MPa.
15. What do you mean by critical pressure of the journal bearing?
16. Why hollow shaft is preferred over solid shaft?
17. What is nipping in leaf spring?
18. What are the types of design?
19. What do you mean by flywheel?
20. What do you mean by crank effort diagrams?

PART C (5 x 14 = 70 Marks)

21. a) A propeller shaft transmits a twisting moment of 100KN-m, and an axial thrust of 250KN. The propeller is fitted very close to the bearing so that the bending effect may be considered as negligible. The external diameter of the shaft is 250mm and internal diameter is 180mm. determine the maximum values of the compressive and shear stress.

(OR)

b) A steel rod is subjected to reverse axial loading of 180KN. Find the diameter of rod for a factor of safety column has tensile strength of 1070N/mm2 and yield strength of 910N/mm2. Correction factors are taken as axial loading factor 0.7, machining surface factor 0.8, size factor 0.85, stress concentration factor = 1

22. a) Design a C.I muff coupling for a mild steel shaft to transmit 40KW at 350rpm. The allowable shear stress in the key and shaft is not to exceed 45MPa, and that in the cast iron sleeve is 15MPa.

(OR)

b) A propeller requires 250KW power to drive it at a speed of 5m/s and at this speed, the propeller rotates at 240rpm. Determine the diameter of the shaft, if the permissible shear stress is 45 MPa, and the angle of twist per metre, if the modulus of rigidity as $0.84x10^5$ MPa.

23. a) A 100mm diameter shaft, running at 240rpm is supported on a foot step bearing. The bearing area is annular with 100mm outside diameter and 35mm inside diameter. The permissible bearing pressure is 1.5N/mm2. Determine the heat generated at the bearing.

(OR)

b) The thrust of a propeller shaft in a marine engine is taken up a number of collars integral with the shaft, 300mm in diameter. The thrust on the shaft is 200KN, and the speed of the shaft is 90rpm. Assuming the co – efficient of friction as 0.05, and the bearing pressure as 0.35N/mm2; determine the number of collars required, and the power lost in friction also the thickness of the collars.

24. a) A pull in a turn buckle of a rope in a electric post is 15 KN. Design turn buckle taking same stresses for rods and turn buckle as 75 MPa, 50MPa, and 90 Mpa in tension, shear and crushing respectively . take n = 1.3

(OR)

b) A plate 100mm wide and 10mm thick is to be welded to another plate by transverse fillet weld and a double parallel weld. If load P = 80KN, find the length of the parallel weld and total length of welding if the stress acting on welding is 55 MPa.

25. a) Design a helical spring to be used for a balance to measure 0 to 1200 N over a scale of length , 100mm. the spring is to be enclosed in a space of 35mm diameter. Approximate number of turns is 25. Take the modulus of rigidity as 0.84×10^5 MPa. Also calculate the maximum shear stress induced.

(OR)

b) A load of 1KN is dropped axially on a close coiled helical compression spring; from a height of 250mm. the spring has 20 active coils. Take wire diameter as 20 mm. spring index is 8. Determine the deflection and stress induced in the spring. Take the modulus of rigidity as 0.84×10^5 MPa.

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