

Register Number:

B.E., DEGREE EXAMINATIONS: NO/DEC 2012

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. The type of loads and type of materials that involve the use of a stress concentration factor are
 - a) Static and Ductile
 - b) Dynamic and Brittle
 - c) Dynamic and Ductile
 - d) Static and Brittle
2. The transverse fillet weld is designed for
 - a) Tensile strength
 - b) Compressive strength
 - c) Shear strength
 - d) None of these
3. A bolt is specified as M30 x 2 , here 30 and 2 are respectively
 - a) Nominal diameter and pitch
 - b) Core diameter and pitch
 - c) Pitch and area of the threads
 - d) Area of threads and pitch
4. The diameter of a solid shaft made of mild steel rotating at 250rpm is 45mm. the shaft is designed to transmit 45 KW. What will be the factor of safety if ultimate shear stress is taken as 380 N/mm²?
 - 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. The diameter of bearing and journal for a hydrodynamic journal bearing are 20cm and 16 cm respectively. What will be the value of diametrical clearance ratio?
 - a) 5
 - b) 4
 - c) 1/5
 - d) 1/4
8. In the cross head of steam engines, the bearing used is a
 - a) Rolling contact bearing
 - b) Sliding contact bearing
 - c) Radial bearing
 - d) Thrust bearing

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. What are causes for stress concentration factor?
12. What do you mean by curved beams?
13. What do you mean by flexible coupling?
14. What do you mean by Mechanical Key?
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 is the function of flywheel?
20. What do you mean by crank effort diagrams?

PART C (5 x 14 = 70 Marks)

21. a) Determine the diameter of a circular rod made of ductile material with a fatigue strength (endurance limit) of 265MPa and a tensile yield strength of 350MPa, the member is subjected to a varying axial load from $W_{min} = -300\text{KN}$ to $W_{max} = 700\text{KN}$ and has a stress concentration factor 1.8 use factor of safety as 2.

(OR)

- b) A mild steel shaft of 5cm diameter is subjected to a bending moment of 20,000Kgf – cm and a torque T, if the yield point of the steel in tension is 2000 Kgf/cm², find the maximum value of torque without causing yielding of the shaft according to (i) Maximum principal stress, (ii) Maximum shear stress (iii) The maximum distortion strain energy theory of yielding.
22. a) Design a bushed pin type flexible coupling for the following, power = 40KW, shaft speed = 1000 rpm. Select Materials.

(OR)

- b) Three pulleys A,B,C are mounted on a shaft and are at a distance of 1200mm,2100mm and 2700mm respectively from left hand bearing. Bearing are 3600mm apart. Pulley A is 50cm , B is 75 cm and C is 37.5 cm in diameter. A power unit supplies 20HP to A and machineries take 12Hp from B and 8 HP from C. A is horizontal drive right side, B is vertically downwards drive and C is taken off at 45°to drive A, and in downward direction. Speed of the shaft is 200 rpm and allowable shear stress in the shaft is 320 Kgf/cm² and angle of lap of belt is 180° in each case and coefficient of friction is 0.32, design the shaft.

23. a) Select a suitable deep groove ball bearing for a drilling machine spindle of 40mm diameter. Radial load is 2 KN, thrust load is 1.5 KN. Speed is 3000 rpm. Designed life is 3000 Hrs.

(OR)

- b) A 80mm diameter full journal bearing supports a radial load of 600 Kgf. The length of the bearing = 80mm. the speed of the shaft = 600 rpm. The oil film thickness = 0.03mm. The diametrical clearance = 0.17mm. Design the bearing.

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 compression spring for a maximum load of 1000N for a deflection of 20mm. the value of spring index as 6. The maximum permissible shear stress = 400N/mm² · C=84KN/mm²

(OR)

- b) The disc spring is made of 3mm sheet metal with an outside diameter of 125mm and an inside diameter of 50mm, the spring is dished 4.5mm, the maximum stress is 560N/mm² . Design the spring
