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(E.T)

B.E / B. Tech END SEMESTER EXAMINATIONS April / May 2019

MECHANICAL ENGINEERING

5<sup>TH</sup> Semester

ME8501- DESIGN OF MACHINE ELEMENTS

(Regulation 2012)

Usage of PSG design data book is allowed

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20)

1. Enlist the various phases of a design process
2. Define isotropy and resilience
3. What is known as flexible shaft
4. Differentiate clutch and coupling
5. State the advantages of pre loading of bolts
6. Name any two tests which are carried out to check the strength of the bonded joints.
7. Why camber is provided in leaf springs?
8. State the advantages of helical springs over other springs
9. Draw a neat sketch of rolling contact bearing and sliding contact bearing with labeling.
10. What are the types of crank shafts



PART-B (5X16=80)

11. The shaft of an overhang crank is subjected to a force  $F$  of 1.5 kN as shown in fig11. The shaft is made of 30Mn2 steel having allowable shear strength equal to  $80 \text{ N/mm}^2$ . Determine the diameter of the shaft.

12. (a) For the shaft shown in fig 12(a) the ratio of belt tension for either belt is 3:1. The maximum tension in the belt is 3000N.  $S_{ut} = 650 \text{ MPa}$ ,  $S_y = 400 \text{ MPa}$  for the shaft material.  $K_m = 1.5$  and  $K_t = 1.2$ . Determine the shaft diameter and angle of twist when the pulleys are keyed to the shaft.

(OR)

12. (b) Design a clamp coupling to transmit 30 kW at 120 rpm. The shaft and key are made of mild steel for which permissible shear stress is 40 MPa. The two halves are connected by four bolts, and the permissible tensile stress in bolts is 70 MPa. The coefficient of friction between the sleeve and the shaft surface may be taken as 0.3.

13. (a) Load on a hydrodynamic full journal bearing is 20 kN. The diameter and speed of the shaft are 100 mm and 1500 rpm respectively. Diametral clearance 0.2 mm. Somerfield number is 0.631. L/D ratio 1:1. Calculate temperature rise of oil, quantity of the oil, heat generated and type of oil required.

13. (b) A deep groove ball bearing No. 6308 selected for a particular application carries a radial load of 2900 N and a thrust load of 1800 N, both being steady. The inner race of the bearing rotates at 900 rpm. The bearing is required to have minimum life of 9000 hrs. Check whether the bearing can serve the purpose.

14. (a) A plate of 100 mm width and 12 mm thick is to be welded to another plate by means of double parallel fillet welds as shown in fig. 14.(a)(i). The joint is subjected to a load of 80 kN. Determine the length of the weld,  $l$ , if the permissible shear stress in the weld is not to exceed 50 MPa.

If the joint to be welded is as shown in fig 14(a)(ii), determine the load that can be resisted by the joint. Take permissible tensile stress for the weld as 60 MPa.

(OR)

14. (b) (i) What is gib and cotter joint? State its application ( 4 marks)

(ii) Fig 14 (b) shows a gib and cotter joint, which is to be subjected to static tensile load. Determine the load carrying capacity of it showing different modes of failure. (12 marks)

15. (a) Design a helical compression spring to sustain an axial load of 3 kN. The deflection is 60 mm. Spring index is 6. The shear stress is not to exceed 300 MPa. Rigidity modulus for spring material is 81 GPa.

(OR)

15. (b) Design a leaf spring for the following specifications for a truck. Assume FOS = 3. Maximum load on springs = 120 kN, No. of springs = 4, Material of springs = Cr Va steel ( $\sigma_u = 1380$  MPa and  $E = 206 \times 10^3$  MPa), Span of spring = 1200 mm, Width of central band = 200 mm, Permissible deflection = 120 mm, Assume 2 full length leaves and 6 graduated leaves.

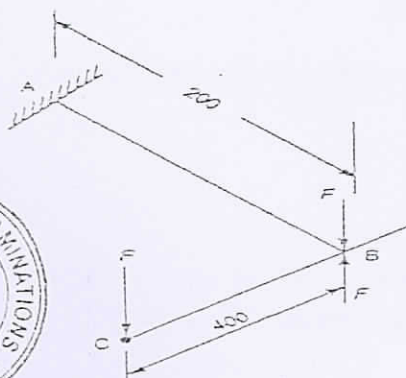


Fig.11

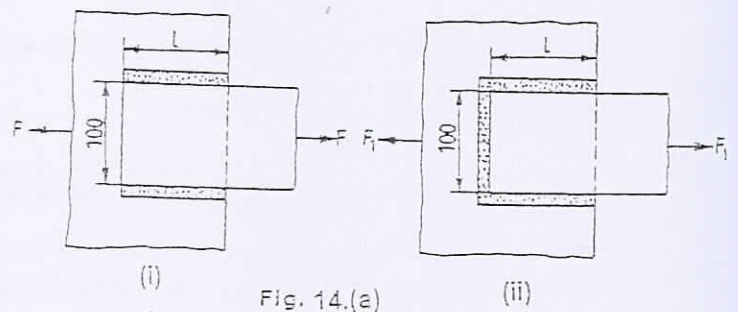


Fig. 14.(a)

(ii)

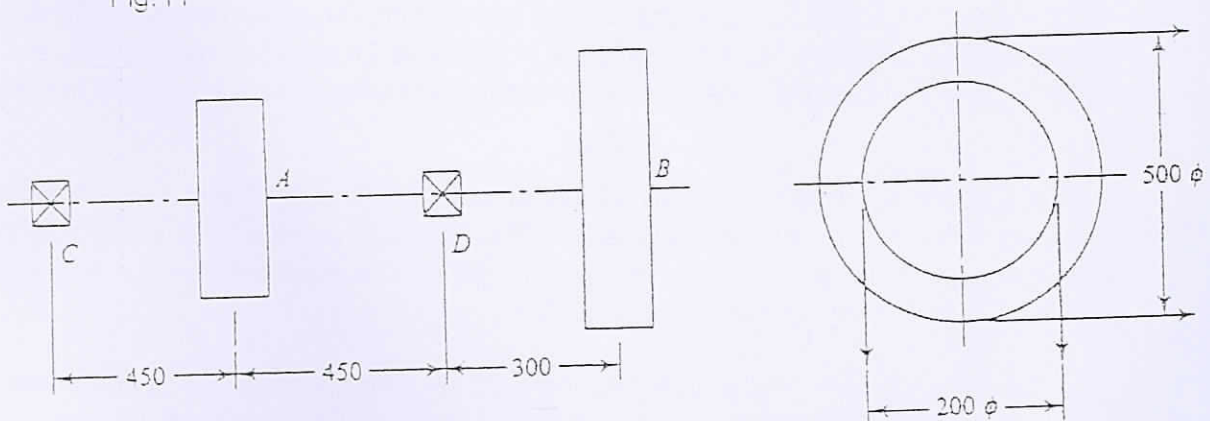


Fig 12(a)

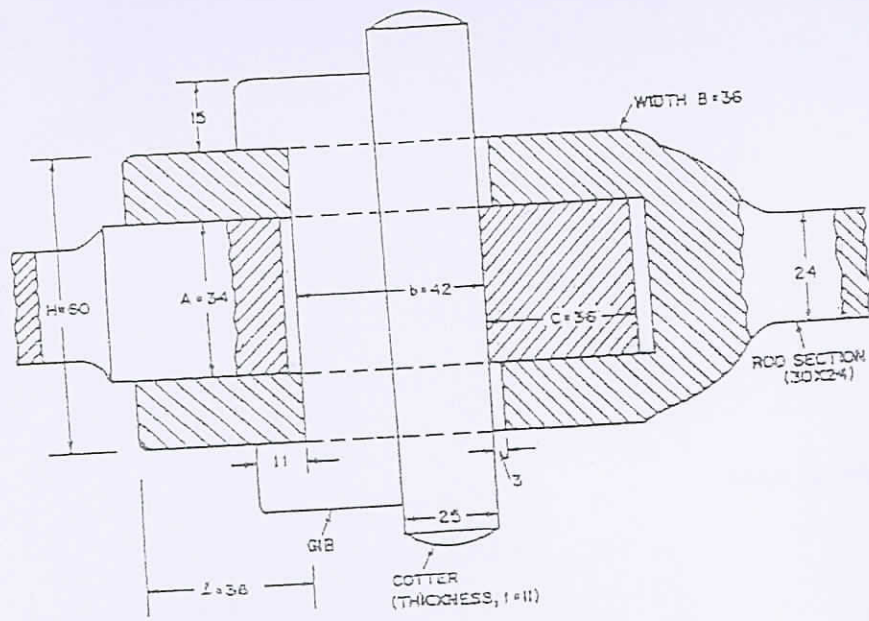


Fig. 14 (b)

