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Reg. No.

B.E (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL 2011

MECHANICAL ENGINEERING

FIFTH SEMESTER (Regulation 2008)

ME 9305 - DESIGN OF MACHINE ELEMENTS

(Use of PSG Design data book is permitted)

Time: 3 Hours **Answer all the questions** **Max. Marks: 100**

PART – A (10 x 2 = 20 Marks)

1. Define – factor of safety. Write factor of safety formula for ductile and brittle materials.
2. Which failure theory is more suitable to design a component made of brittle material and ductile material?
3. Define stress concentration and stress concentration factor.
4. Differentiate between shaft, axle and spindle.
5. Write the difference between rigid coupling and flexible coupling.
6. What are all the advantages of welded joints compared with riveted joints?
7. What are the requirements of spring while designing?
8. What is wahl's correction factor?
9. What is the purpose of flywheel in IC engine?
10. What is journal bearing? List any two applications.

PART – B (5 x 16 = 80 Marks)

11. A line shaft is to transmit 30 kW at 160 rpm. It is driven by a motor placed vertically under it by means of a belt running on a 100 cm diameter pulley keyed to the end of the shaft. The angle of lap on the pulley is 170° and the coefficient of friction is 0.3. The centre of the pulley overhangs 15 cm beyond the centre line of the end bearing. Determine the diameter of the shaft, if the permissible shear stress is 55 N/mm^2 and the pulley weighs 1500 N.

12. (a) A bolt is subjected to a tensile load of 18 kN and a shear load of 12 kN. The material has an yield stress of 328.6 N/mm^2. Taking factor of safety as 2.5, determine core diameter of bolt according to various theories of failure. Take passion ratio = 0.289.

[OR]

(b) Calculate the stresses at points A and B for a circular beam as shown in Figure.1. The circular beam is subjected to a compressive load of 5 kN. All the dimensions are in mm.

13. (a) A bracket shown in Figure.2 carries a load of 135 kN. Calculate the size of the weld, if the allowable stress is not to exceed 70 N/mm^2.

[OR]

(b) Two rods subjected to a tensile force of 50 kN are connected by means of knuckle joint, Steel 30C8 and the factor of safety is 5. Design the joint and specify the dimensions of its components.

14. (a) A rail wagon of 250 kN is moving with a velocity of 2 m/s. it has to be brought to rest by two buffer springs. Mean diameter of the springs is 330 mm and the permissible stress is 660 N/mm^2. Design the springs taking the maximum deflection as 150 mm.

[OR]

(b) Design a leaf spring for a truck for the following specifications.

Maximum load on the truck = 160 kN

No. of springs = 4

Max no. of leaves = 12

Span of spring = 1100 mm

Permissible stress = 600 N/mm^2

Permissible deflection = 100 mm

No. of extra full length leaves = 2

15. (a) The mean diameter of a Whitworth bolt having V threads is 25 mm. The pitch of the thread is 5 mm and the angle of V is 55°. The bolt is tightened by screwing a nut whose mean radius of bearing surface is 25 mm. If the coefficient of friction for nut and bolt is 0.1 and for nut and bearing surface is 0.16, find the force required at the end of a spanner 0.5 m long when the load on the bolt is 8 kN. (16 marks)

(OR)

(b) In a thrust bearing the external and internal radii of the contact surfaces are 210 mm and 160 mm respectively. The total axial load is 60 kN and co efficient of friction = 0.05. The shaft is rotating at 380 rpm. Intensity of pressure is not to exceed 350 kN/m^2. Calculate (i) power lost in overcoming the friction and (ii) number of collars required for the thrust bearing. (16 marks)

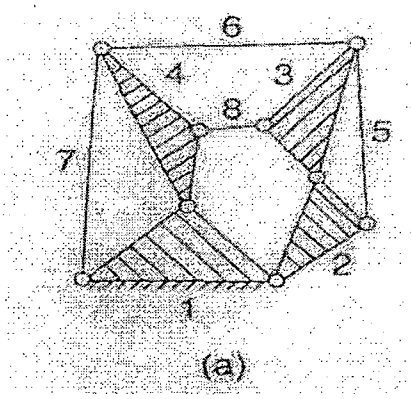

Fig 11(a)

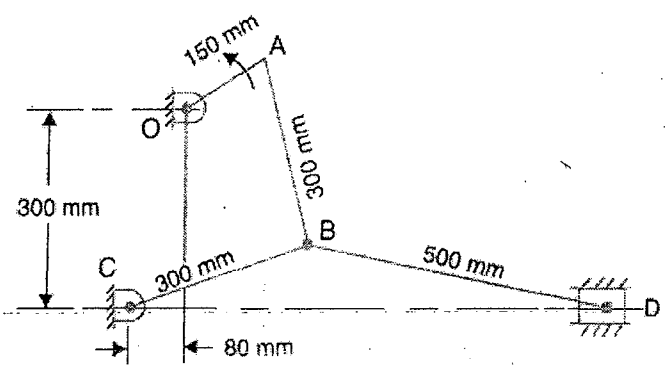

Fig 12(a)

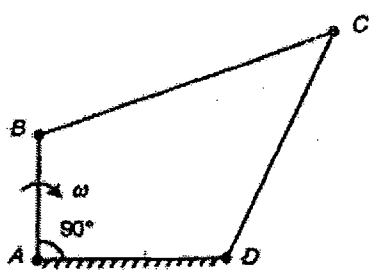

Fig 12(b)

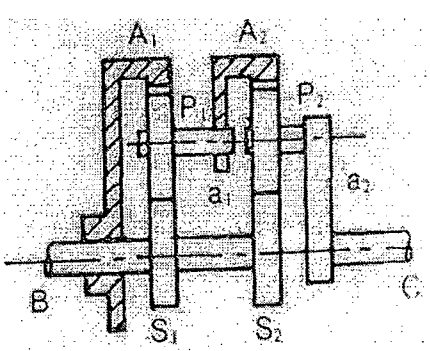

Fig 14(b)