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10ME62

Sixth Semester B.E. Degree Examination, July/August 2021
Design of Machine Elements – II

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. What are the assumptions made in finding stress distribution for a curved flexural member also give 2 differences a straight and curved beam. **(06 Marks)**

b. Determine the value of 'T' in the cross section of a curved machine member shown in Fig.Q.1(b) so that the normal stresses due to the bending at the extream fibers are numerically equal also determine the normal stresses induced at extream fibers due to a bending moment of 10kN-m. **(14 Marks)**

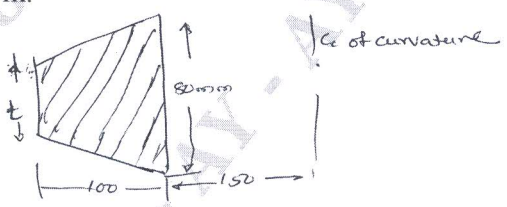

Fig.Q.1(b)

2 a. Show that in flat belt drives the ratio of belt tension is given by $\frac{T_1}{T_2} = e^{\mu\theta}$ where T_1 and T_2 are belt tension. 'μ' is the coefficient of friction and θ is the angle of wrap. **(06 Marks)**

b. Select a V-belt drive to connect a 15kW, 2880rpm motor to a centrifugal pump running at approx 2400rpm for a service of 18 hours/day. The centre distance should be approx 400mm. Assume pitch diameter of a driving pully as 125mm. **(14 Marks)**

3 a. What is surging in helical springs and how it can be eliminated? **(04 Marks)**

b. A Rail way wagon weighing 50kN and moving with a speed of 8km/hours has to be stopped by 4 buffer springs in which the maximum compression allowed is 220mm. Find the number of turns or coils in each spring of mean diameter 150mm. The diameter of spring wire is 25mm. Take 'G' = 84GPa. Also find the shear stresses. **(08 Marks)**

c. A locomotive spring has overall length of 1100mm and sustain a load of 75kN at its centre. The spring has 3 full length leaves and 15 graduated leaves with a central band of 100mm. All the leaves are to be stressed at 0.4GPa when fully loaded. The ratio of total spring depth width is 10. Determine:

i) Width and Thickness of leaves.

ii) Initial gap that must be provided between full length and graduated leaves before the load is applied.

iii) What load is excerted on the band after the spring is assembled? **(08 Marks)**

4 Design a pair of spur gears to transmit 20kW from a shaft rotating at 1000rpm to a parallel shaft which is to rotate at 310rpm assume the number of teeth on pinion 31 and 20° full depth form the material for pinion is C45 steel untreated and for gear cast steel 0.20% C untreated. **(20 Marks)**

5 Complete the design and determine the input capacity of a worm gear speed reducer unit which consists of a hardened steel warm and phosphorus bronze gear having 20° stub involute teeth the centre distance is to be 200mm and transmission ratio is 10 and worm speed is 200rpm. **(20 Marks)**

6 a. A multiple plate clutch has steel on bronze is to transmit 8kW at 1440rpm the inner diameter of the contact is 80mm and at the outer diameter of the contact is 140mm the clutch operates in oil with expected coefficient of friction of 0.1 the average allowable pressure is 0.35MPa. Assume uniform wear theory and determine the following:

i) Number of steel and bronze plates
ii) Axial force required
iii) Actual maximum pressure. **(10 Marks)**

b. A differential band brake as shown in Fig.Q.6(b) the width and the thickness of the steel band are 100mm and 3mm respectively. And the maximum tensile stresses in the band is 50N/mm^2. The coefficient of friction between the friction lining and the break drum is 0.25. Calculate: i) Tension in the band ii) Actuating force iii) Torque capacity of the break. Check wheather the break is self locking? **(10 Marks)**

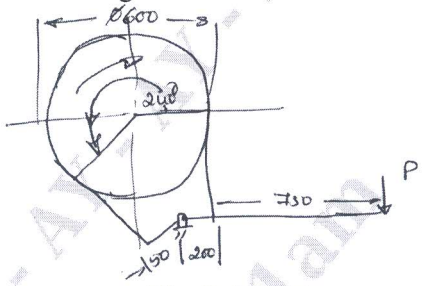

Fig.Q.6(b)

7 a. List the different forms of lubrication and bearing materials. **(04 Marks)**

b. A full journal bearing 50mm in a diameter and 50mm long operates at 1000rpm and carries a load 5kN. The radial clearance is 0.025mm the bearing lubricated with SAE 30 oil and operating temperature of oil is 80°C. Assume the attitude angle as 60°. Determine:

i) Bearing pressure
ii) Somerfield number
iii) Attitude
iv) Maximum film thickness
v) Heat generated
vi) Heat dissipated if the ambient temperature is 20°C
vii) Amount of artificial cooling if necessary use Mckee's and Pederson equations. **(16 Marks)**

8 Design a connecting rod for a petrol engine from the following data. Cylinder bore diameter of piston is equal 100mm. Length of connecting rod 350mm. Maximum gas pressure or explosion pressure 3N/mm^2. Length of a stroke is 150mm engine speed 1500rpm. Rate of reciprocating parts 25N. Compression ratio 4:1. Assume any further data required for the design. **(20 Marks)**

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