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06ME61

Sixth Semester B.E. Degree Examination, June/July 2016
Design of Machine Elements – II

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. ***Use of design data handbook is permitted.***

PART – A

1 a. Derive expression for normal stresses due to bending across the cross-section of a curved beam. **(10 Marks)**

b. Determine the value of 't' in the cross-section of the curved beam shown in Fig.Q1(b), such that the extreme fibre stresses are subjected to equal stresses.

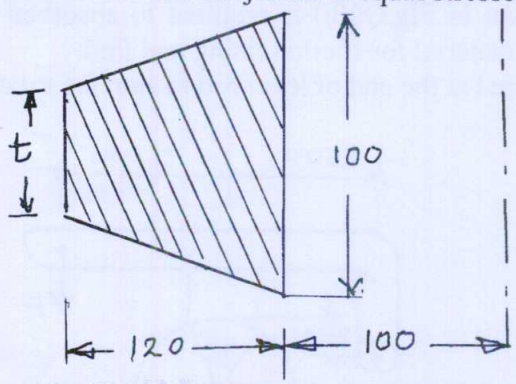

Fig.Q1(b) All dimensions are in mm. **(10 Marks)**

2 A carbon steel C50 barrel with diameters 25 mm and 50 mm is to be shrink fitted into another carbon steel C50 barrel with diameters 50 mm and 75 mm. The tangential stress developed in the inner fibre of the outer barrel due to shrink fitting must be limited to 70 MPa. The Young's modulus of material is 210 GPa and Poison's ratio is 0.28. Determine:
i) The contact pressure
ii) The original diameters at contact before shrinking
iii) The resulting stress distribution due to shrink fitting. **(20 Marks)**

3 a. A loaded narrow gauge car having a mass of 1800 kg and moving with a velocity of 1.2 m/s is brought to rest by a bumper consisting of two helical steel springs of square cross-section, the mean diameter of coil is six times side of square section. In bringing the car to rest the springs are compressed by 200 mm. Assuming the design shear stress of spring material as 360 MPa and modulus of rigidity as 80 GPa, determine:
i) Maximum load on each spring ii) Sides of square section of spring wire
iii) Mean diameter of coils iv) Number of coils. **(10 Marks)**

b. A Beueville spring is made of 3 mm steel sheet with outer diameter 125 mm and inner diameter of 50 mm. The spring is dished by 5 mm. The maximum stress is to be 500 MPa. Assuming the Young's modulus to be 211 GPa and Poisson's ratio as 0.3. Determine:
i) Deflection of spring
ii) Load that may be carried
iii) Stress produced at the outer edge. **(10 Marks)**

4 a. Define virtual number of teeth and obtain an expression for the same for a helical gear. **(06 Marks)**

b. Determine the module and face width of a spur gear transmitting 20 KW from a shaft running at 1200 rpm to another shaft running at 400 rpm. Both gears are made of same material (SAE1030) having allowable static stress of 220 MPa. The minimum number teeth on pinion should be 20. The gears are subjected to medium shock with 8-10 hrs per day service and the service factor is 1.5. **(14 Marks)**

PART – B

5 Design a pair of bevel gears to connect two shafts at 60°. The power transmitted is 25 KW at 900 rpm of pinion. The reduction ratio desired is 5:1. The teeth are 20° full depth and pinion has 24 teeth. Check the design for dynamic and wear considerations give the specifications of gear pair. **(20 Marks)**

6 a. Design a cone clutch to transmit 15 KW at 720 rpm. Select Asbestos as material for friction lining. Also determine the axial force necessary to engage the cone clutch. **(10 Marks)**

b. A block brake shown in Fig.Q6(b) is required to absorbed 15 KW of power at 720 rpm. Choose asbestos as material for friction lining and find:

i) The force required at the end of lever rod to stop the rotation of drum and

ii) Width of block.

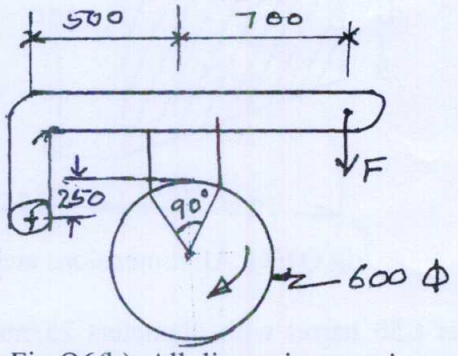

Fig.Q6(b) All dimensions are in mm **(10 Marks)**

7 a. Define: i) Viscosity, ii) Newtanian fluid, iii) Viscosity index. **(06 Marks)**

b. A full journal bearing has the following specifications:
Journal diameter = 68.75 mm, bearing length = 55 mm, radial clearance = 0.055 mm, journal speed = 22000 rpm, radial load = 1.1 kN.
The power loss in the bearing was found to be 3.85 KW. Considering the bearing as highly loaded. Determine: i) The viscosity of lubricant at effective temperature, (ii) The coefficient of friction under the given operating conditions. **(14 Marks)**

8 a. Select a V-belt drive to transmit 8 KW of power from a pulley of pitch diameter 150 mm mounted on a squaral cage shunt motor running at 720 rpm to another pulley mounted on a wood working machinery to run at 300 rpm. Severity of service is heavy duty and service per day varies from 10 hrs to 14 hrs. The centre distance between centres of pulley is 300 mm. **(10 Marks)**

b. A roller chain has to transmit power from a smaller sprocket to another sprocket at a transmission ratio of 6. The smaller sprocket has 20 teeth and rates at 1200 rpm. Select a suitable pitch for the chain if two strands are used. What is the power capacity of the chain drive? Also determine the length of chain. **(10 Marks)**

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