CBCS SCHEME

15AU63

Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Design of Machine Elements – II

Time: 3 hrs. Max. Marks: 80

Note: 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *Use of design data hand book is permitted.*

Module-1

1 a. Differentiate between curved beam and straight beam. **(04 Marks)**
   b. Determine the value of steam thickness 't' in the T-section of a curved beam shown in Fig Q1(b) such that the normal stresses due to bending at extreme inner and outer fibres are numerically equal.
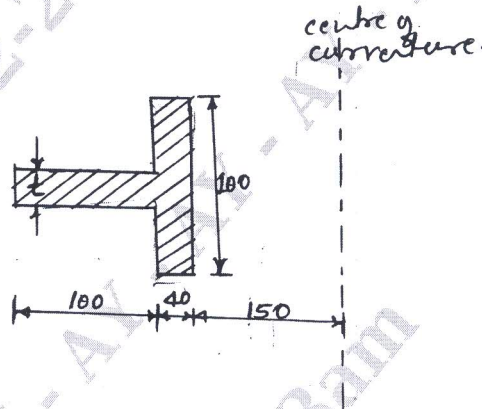

Fig Q1(b) **(12 Marks)**

OR

2 a. A railway Wagon weighing 40kN and moving with a speed of 10km/hr has to be stopped by four buffer springs in which the maximum compression allowed is 200mm. find the number of active turns in each spring of mean diameter 150mm. The diameter of spring wire is 25mm. Take G = 82.7GPa. **(08 Marks)**
   b. Determine the width and thickness of leaves for a six leaf cantilever spring, 400mm long to carry a load of 3kN and having deflection of 40mm. The allowable stress in spring material is 320MPa. Take E = 200GPa. **(08 Marks)**

Module-2

3 Design a pair of spur gears having 20° FDI System is to transmit 12kW at 300 rpm of the pinion. The allowable static stress for cast iron gear is 60MPa and for the steel pinion is 105MPa. Check strength for dynamic and wear. Assume velocity ratio is 3:1 and endurance strength as 580MPA. **(16 Marks)**

OR

4 Design a pair of helical gears to transmit a power of 20kW from a shaft running at 1000rpm to a parallel shaft to be run at 350rpm. Pinion and gear are made up of same materials. **(16 Marks)**

Module-3

5 A pair of straight tooth level gear at right angle is to transmit 5kW at 1500rpm of the pinion at a speed of ratio of 3, Diameter of pinion is 75mm. The tooth form is $14\frac{1}{2}^°$ involutes.

Pinion is made up of steel (σ_d = 160MPa) and gear of CI (σ_d = 80MPa). Design the gear and check dynamic and wear strength. **(16 Marks)**

OR

6 Design a worm gear to transmit 40kW at 1000rpm of the worm. The desired velocity ratio is 25:1. The worm is of hardened steel and the worm wheel is of phosphor bronze having allowable stress of 75MPa. **(16 Marks)**

Module-4

7 a. A multiplate clutch is used to transmit 5kW power at 1440rpm. The inner and outer diameter of contacting surfaces are 50mm and 80mm respectively. The co-efficient of friction and the average allowable pressure intensity for the lining may assumed as 0.10 and 350 KPa respectively. Determine:
   i) Number of friction plates and pressure plate
   ii) Axial force required to transmit power
   iii) The average pressure
   iv) Maximum pressure intensity after wear. **(10 Marks)**

  b. Derive an expression for torque transmitted clutch considering uniform wear. **(06 Marks)**

OR

8 a. Mansion the different types of mechanical brakes used in Automobiles. **(06 Marks)**

  b. A simple band brake is shown in Fig Q8(b). The diameter of the drum is 900mm and the band thickness is 5mm. The co-efficient of friction is 0.25 and the arc of contact is 270°. The brake drum is attached to hoisting drum that sustains load of 9kN. Determine :
   i) Force required to just support the load
   ii) Force when the direction of rotation is reversed
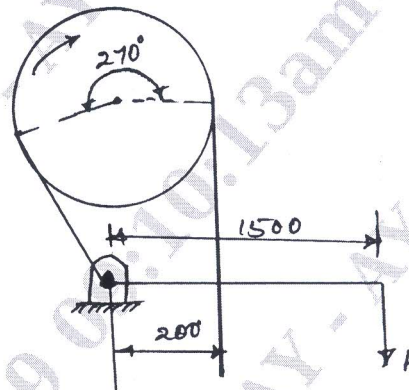   iii) Band width, Take σ_d = 50MPa.

Fig Q8(b) **(10 Marks)**

Module-5

9 a. Derive Petroff's equations for coefficient of friction in journal bearing. **(06 Marks)**

  b. A 75mm long full journal bearing of 75mm diameter supports a load of 12kN at the shaft speed of 1800 rpm. Assume ratio of diameter to diameteral clearance as 1000. The viscosity of oil is 0.01Pa.S at the operating temperature. Determine :
   (i) Summerfield number   (ii) The coefficient of friction
   (iii) Heat generated   (iv) Heat dissipated. **(10 Marks)**

OR

10 a. List the application of Anti-friction bearings. **(04 Marks)**

   b. A single row deep groove ball bearing is subjected to a radial force of 7kN and thrust force of 2.2kN. The shaft rotates at 1200 rpm. The expected life L_{10th} of bearing is 20,000h. The minimum acceptable diameter of shaft is 75mm. Select a suitable ball bearing for this application Take X = 0.56 and Y = 1.8. **(12 Marks)**

* * * * *