CBCS SCHEME

USN 15AU63

Sixth Semester B.E. Degree Examination, Aug./Sept.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 a straight beam and a curved beam. **(04 Marks)**

b. A railway wagon weighing 3 tonnes is moving with velocity of 3 m/s. It is brought to rest by two buffer springs of 200 mm deflection. The springs have an index of 6 and permissible sheer stress of 450 MPa. Design the spring. Take G = 81.4 GPa. **(12 Marks)**

OR

2 a. Derive an expression for stress induced in helical coiled spring. **(06 Marks)**

b. Determine the width of larger side of a T-section shown in Fig.Q2(b). For the extreme fibre stresses in bending to be numerically equal.

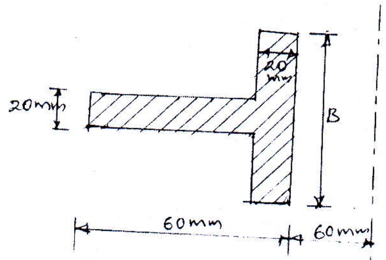

Fig.Q2(b) **(10 Marks)**

Module-2

3 A pair of spur gear having 20° FDI system is to transmit 12 KW at 300 rpm of pinion. The allowable static stress for steel pinion is 105 MPa and for CI gear is 60 MPa. Design the gears and check for dynamic and wear loads. Take velocity ratio is 3:1 and σ_{en} = 580 MPa. **(16 Marks)**

OR

4 Design a pair of helical gears having 20°stub system is to transmit 34 KW at 2800 rpm of pinion. Take: speed ratio = 4.5, helix angle = 25°, diameter of pinion = 125 mm, number of teeth on pinion = 18. The material for both pinion and gear is steel (σ_o = 230 MPa). Check for dynamic and wear load. **(16 Marks)**

Module-3

5 A pair of straight tooth level gears at right angles is to transmit 5 KW at 1500 rpm of pinion at a speed ratio of 3. Diameter of the pinion is 75 mm. The tooth form is 14½° involute. Pinion is made up of steel (σ_d = 160 MPa) and gear of CI (σ_d = 80 MPa). Design the gears and check for dynamic and wear loads. **(16 Marks)**

OR

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

Module-4

7 a. Derive an expression for troque transmitted in plate clutch considering unifier wear theory. **(06 Marks)**

b. A multi-plate clutch is used to transmit 5 KW at 1440 rpm. The inner and outer diameter of contacting surfaces are 50 mm and 80 mm respectively. The coefficient of friction and the allowable pressure intensity for the lining may assumed as 0.10 and 350 kPa. Determine:

(i) Number of friction plates and pressure plates
(ii) Axial force required to transmit power
(iii) The actual average pressure
(iv) Actual maximum pressure intensity after wear. **(10 Marks)**

OR

8 a. How the Brakes are classified? List different types of mechanical brakes. **(06 Marks)**

b. A differential band brake is shown in Fig.Q8(b). The width and thickness of the steel band are 100 mm and 3 mm respectively and the maximum tensile stress in the band is 50 N/mm^2. The coefficient of friction lining and the brake drum is 0.25. Calculate:

(i) The tension in the band
(ii) The actuating force
(iii) The capacity of brake and check for self locking.

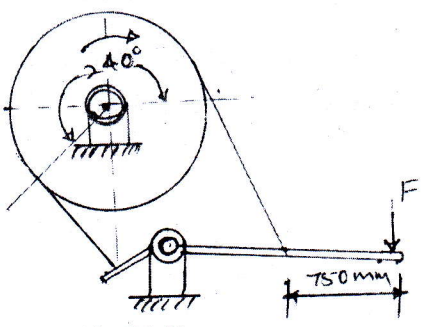

Fig.Q8(b) **(10 Marks)**

Module-5

9 a. Drive the Petroffs equation and state assumptions. **(06 Marks)**

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

OR

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

b. A single row deep groove ball bearing is subjected to a radial force of 7 kN and thrust force of 2.2 kN. The shaft rotates at 1200 rpm. The expected life $L_{10^{th}}$ of the bearing is 20000 hrs. The minimum acceptable diameter of the shaft is 75 mm. Select a suitable ball bearing for this application. Take X = 0.56 and Y = 1.8. **(12 Marks)**

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