USN | | | | | | | | | | |

10AU63

Sixth Semester B.E. Degree Examination, June/July 2017
Design of Machine Elements – II

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. What are the assumptions made in finding stress distribution for a curved flexural member? List out the main differences between straight and curved beam. Also sketch the stress distribution pattern in a curved beam and compare it with a straight beam. **(10 Marks)**

b. A curved link mechanism made from a round steel bar is shown in Fig.Q1(b). The material for the link is plain carbon steel $30C_8$ with an allowable yield strength of 400 MPa. Determine the factor of safety. **(10 Marks)**

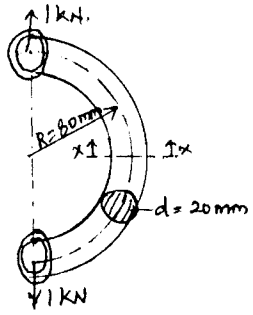

Fig.Q1(b)

2 a. Write the comparison between thin, thick and compound cylinders. **(06 Marks)**

b. A shrink fit assembly, formed by shrinking one tube over another, is subjected to an internal pressure of 60 N/mm^2. Before the fluid is admitted, the internal and the external diameters of the assembly are 120 mm and 200 mm and the diameter at the junction is 160 mm. determine using Lame's equations, the stresses at the inner, mating and outer surfaces of the assembly after the fluid has been admitted. Take the contact pressure at the junction after shrinking is 8 N/mm^2 **(14 Marks)**

3 a. Derive an expression for the deflection in a helical compression spring with usual notations. **(10 Marks)**

b. A truck spring has 12 number of leaves, two of which are full length leaves. The spring supports are 1.05 m apart and the central band is 85 mm wide. The central load is to be 5400 N with a permissible stress of 0.28 GPa. The ratio of total depth of spring is 3 and modulus of elasticity = 210 GPa. Determine the thickness and width of the steel spring leaves. Also determine the deflection of the spring. **(10 Marks)**

4 a. A multiplate clutch has steel on bronze is to transmit 8 kW at 1440 rpm. The inner diameter of the contact is 80 mm and the outer diameter of contact is 140 mm. The clutch operate in oil with expected coefficient of friction of 0.1, the average allowable pressure is 0.35 N/mm^2. Assume uniform wear theory and determine the following:

i) Number of steel and bronze plates.

ii) Axial force required and

iii) Actual maximum pressure. **(12 Marks)**

b. Explain block brake and band brake. **(08 Marks)**

PART – B

5 Design a pair of spur gears to transmit 20 kW from a shaft rotating at 1000 rpm to a parallel shaft which is to rotate at 310 rpm. Assume number of teeth on pinion 31 and 20° full depth tool form. The material for the pinion is C45 steel untreated and for gear cast steel 0.20% C untreated. Take service factor 1.5. **(20 Marks)**

6 A pair of bevel gear wheels with 20° pressure angle consist of 20 teeth pinion meshing with 30 teeth gear. The module is 4mm while the face width is 20mm. The surface hardness of both pinion and gear is 400 BHN. The pinion rotates at 500rpm and receives power from an electric motor. The starting torque of the motor is 150% of the rated torque. Determine the safe power that can be transmitted considering the dynamic load, wear strength and endurance strength. The allowable bending stress may be taken as 240 MPa. **(20 Marks)**

7 a. List the different forms of lubrication and bearing materials and properties. **(06 Marks)**

b. A full journal bearing having diameter of 50 mm and 100 mm long has a bearing pressure of 1.2 N/mm^2. The speed of the journal is 1000 rpm. The bearing is lubricated at 75°C having viscosity of 0.011 pas. The room temp is 35°C. Take minimum film thickness as $1/4^{th}$ of diametrical clearance. The specific heat of oil is 1850 J/kg°C. The ratio of journal diameter to diametric clearance is 1000. Calculate :

i) Load which can be supported by bearing
ii) Power lost due to friction
iii) Attitude of bearing and eccentricity
iv) The amount of artificial cooling required. **(14 Marks)**

8 a. A nylon core flat belt 200mm wide weighing 20 N/m, connecting a 300mm diameter pulley to a 900mm diameter driven pulley at a shaft spacing of 6m transmits 55.2 kW at a belt speed of 25m/s.

i) Belt length and the angle of wrap.
ii) Belt tensions based on a coefficient of friction 0.38. **(10 Marks)**

b. Select a wire rope for a vertical mine hoist to lift a load of 55 kN from a depth of 300 meters. A rope speed of 500 m/min is to be attained in 10 seconds. **(10 Marks)**

* * * * *