CBCS SCHEME

USN | | | | | | | | | | 15ME64

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 hand book is permitted.

Module-1

1 a. Write the difference between a straight and curved beam. **(06 Marks)**

b. The cross-section of a curved link is a symmetrical trapezium 50mm deep. The inner width and outer width are 50mm and 25mm respectively. Find the maximum stress when the link carries a load of 15 kN which passes through the centre of curvature of link. The internal radius of link as 50mm. **(10 Marks)**

OR

2 A tube with 50mm and 75mm as inner and outer diameter respectively, is reinforced by shrinking a jacket of outer diameter 10mm. The compound tube is to withstand an internal pressure of 35 MPa. The shrinkage allowance is such that the maximum tangential stress in each tube has same magnitude. Calculate shrinkage pressure and the original dimensions of the tube. Assume E = 207 kN/mm^2. **(16 Marks)**

Module-2

3 a. Explain the effect of slip, creep and centrifugal tension in flat belt drive. **(03 Marks)**

b. Specify he details of a V-belt drive for a 10 kW, 1160 rpm induction motor operating a fan at approximately 400 rpm. The centre distance between pulley is to be close to 1m, $\alpha = 34°$. **(13 Marks)**

OR

4 a. One helical spring is nested inside another; the dimensions are as tabulated. Both springs have the same free length and carry a total maximum load of 2500 N.

	Outer spring	Inner spring
No. of active coils	6	10
Wire diameter, mm	12.5	9.00
Mean coil diameter, mm	100	70

Determine : (i) The maximum load carried by each spring.
(ii) The total deflection of each spring
(iii)The maximum stress in two springs.
Take G = 83 GN/m^2. **(08 Marks)**

b. A truck spring has 12 numbers of leaves, two of which are full length leaves. The spring supports are 1.05 m apart and the central bond is 85mm wide. The central load is to be 5.4 kN with a permissible stress of 280 N/mm^2. Determine the thickness and width of the steel spring leaves. The ratio of the total depth to the width of the spring is 3. Also determine the deflection of the spring. Take = E = 0.26×10^6 MPa. **(08 Marks)**

Module-3

5 A pair of spur gear with 20° full depth teeth transmits 20 kW at 1500 rpm to the pinion. The speed reduction ratio is 4. Take material for pinion a gear having a permissible static stress of 220 N/mm^2 and 193.2 N/mm^2 respectively. You are required to check the design for dynamic load and prolonged wear. **(16 Marks)**

OR

6 Design a pair of bevel gears at acute angle to transmit 40 kW at 1200 rpm of the pinion with the velocity ratio of 6. Assume C-45 steel for both gears having permissible stress of 233.4 N/mm^2, BHN 200. Take number of teeths on pinion as 25. α = 14½ , θ = 45°. Consider continuous service of medium shocks. **(16 Marks)**

Module-4

7 Design a worm gear drive to transmit 5 kW at 1200 rpm. The speed ratio is to be 25 and the centre distance 250 mm. The worm wheel is made from phosphor bronze with permissible strength of 82.4 N/mm^2 and hardness 100 BHN, while the worm is made from steel 45 with permissible stress 233.4 N/mm^2 and 200 BHN. Load factor (k_l) = 1.25, α = 14.5°. **(16 Marks)**

OR

8 a. A differential bond brake shown in Fig.Q8(a) operates on a drum of diameter 600 mm. The bond is 3.2×100mm and coefficient of friction is 0.22. θ = 300°.

(i) Find the force required at the end of operating lever, when the bond is subjected to a stress of 55 N/mm^2.

(ii) Find the torque applied to the brake drum shaft.

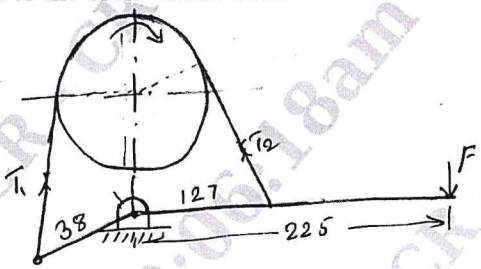

Fig.Q8(a) **(08 Marks)**

b. A cone clutch has a semi-cone angle of 12° to transmit 10 kW of 750 rpm. The width of the face is one fourth of the mean diameter of friction lining. The normal intensity of pressure between the contacting surface is not to exceed 0.85 N/mm^2. Assume uniform wear criterion. μ = 0.2. Calculate dimensions of clutch. Allowable shear stress for shaft material is 40 N/mm^2. **(08 Marks)**

Module-5

9 a. Derive Petroff's equation of lightly loaded bearing. **(08 Marks)**

b. A roller bearing has a dynamic load capacity of 26 kN. The desired life for 90% of the bearing is 8000 hr and the speed is 300 rpm. Calculate the equivalent radial load that the bearing can carry. **(08 Marks)**

OR

10 a. List the factors to be considered while selecting bearing material. **(06 Marks)**

b. A full bearing 200mm diameter by 200mm long supports a radial load 45 kN. The journal rotates at 1200 rpm and r/c = 1000. The viscosity of the oil at its operating temperature of 80°C is 0.1766 N/m^2, ambient temperature is 20°C. Using Raimondi and Boyd curve determine the oil film thickness, coefficient of friction, heat generated in the bearing, Heat dissipated. **(10 Marks)**

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