10ME62

Sixth Semester B.E. Degree Examination, Jan./Feb. 2023

Design of Machine Elements – II

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. Differentiate clearly between a straight beam and a curved beam.   **(06 Marks)**
   b. An open link made from a rod of 40 mm diameter is as shown in the Fig.Q1(b). Determine the maximum tensile and shear stress in the curved beam.
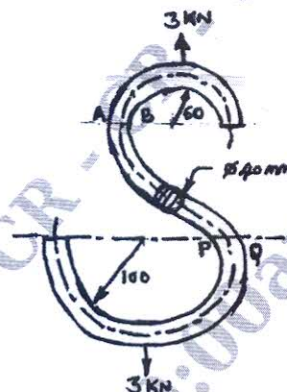

Fig.Q1(b)   **(14 Marks)**

2 a. Discuss the advantages of short center drives with an ordinary open belt drive.   **(04 Marks)**
   b. Design a chain drive to actuate a compressor from 11 KW electric motor at 970 rpm, the compressor rpm being 350. Maximum center distance should be 550 mm. The chain tension may be adjusted by shifting the motor on rails. The compressor is to work 8 hours per day.
                                                                               (16 Marks)

3 a. Define spring. List and explain clearly the different types of springs.   **(07 Marks)**
   b. A car weighing 9800 N when fully loaded, has a wheel base of 2.745 mts and its center of gravity is 1.4488 mm behind the front axle. The car has to spring on four similar longitudinal semi elliptical springs. The distance between the shakel points of the springs is 0.84 mts. Each spring has two full length leaves and 8 graduated leaves with a central band of 10 cm. Design a suitable spring with a maximum stress in leaves to be 500 N/mm^2, when fully loaded. Static load should be multiplied by a load factor of 2.5, to allow impact loads and the maximum should not exceed 76 mm. Consider the Young's modulus of the material as 210 GPa.   **(13 Marks)**

4   A cargo vehicle is driven by a 25.73 KW, 480 rpm motor through medium of single reduction of spur gearing so that that speed of driven gear is about 57 rpm. Determine the module, diameter of gears and face width. Assume 20° involute teeth. Take C-40 steel for pinion and cast steel for gears. Number of teeth on pinion is 22. Maximum load is 150% of running load. Check the design for continuous service.   **(20 Marks)**

PART – B

5   Determine the input power capacity of worm gear speed reduction unit composed of hardened steel worm and phosphor bronze gear having 20° involute system. The center distance is 200 mm and transmission ratio is to be 10. The speed of worm is 1750 rpm.

(20 Marks)

6   a.   A 25 KW at 3000 rpm has to be transmitted by a multiplate friction clutch. The plates have friction surfaces of steel and phosphor bronze alternatively and run in oil. Design the clutch for 25% over load. **(10 Marks)**

     b.   Fig.Q6(b) shows a single block brake. The brake drum diameter is 400 mm and rotates at a speed of 150 rpm. The friction material permits a maximum pressure of 0.5 MPa and $\mu = 0.25$. Face width of the block is 50 mm. If the break is applied for 10 secs at full capacity to bring the shaft to stop, determine:

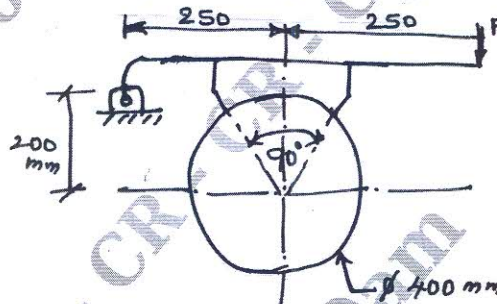   (i) Effort   (ii) Maximum torque   (iii) Heat generated

Fig.Q6(b)   **(10 Marks)**

7   a.   A 75 mm long full journal bearing of dia 75 mm supports a radial load of 12 kN at the shaft speed of 1800 rpm. Assume ratio of diameter to the diametral clearances as 1000. The viscosity of oil is 0.01 Pas at the operating temperature. Determine:

        (i)   Summerfield number

        (ii)   The coefficient of friction based on McKee equation

        (iii)   Amount of heat generated   **(10 Marks)**

     b.   List and explain the properties of good lubricant.   **(05 Marks)**

     c.   Write a note on bearing modulus.   **(05 Marks)**

8   Design a cast iron piston for a single acting four stroke diesel engine from the following data:

Cylinder bore = 100 mm

Stroke length = 125 mm

Speed = 2000 rpm

Break mean effective pressure = 5 MPa

Fuel consumption = 0.25 kg/break power in kW/hr.

Assume any other required data suitably.   **(20 Marks)**

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