G 1213 (Pages : 2) Reg. No.................................

Name.................................

B.TECH. DEGREE EXAMINATION, MAY 2016

Eighth Semester

Branch : Mechanical Engineering

MACHINE DESIGN AND DRAWING—II (M)

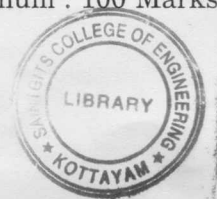(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours

Maximum : 100 Marks

Use of Approved Design data book permitted.
Missing data may be assumed.
Answer any **two** *questions from Part A and Part B.*

Part A

1. (a) Calculate a straight spur gear drive. Transmitted power is 16 kW. Pinion sped is 800 rpm. Speed ratio is 6. The gears are made of C45. Life is to be 5000 hours.

(20 marks)

(b) State the advantages of helical gear drives. (5 marks)

2. Design a worm gear drive to transmit 50 kW at a worm speed of 1000 r.p.m. Velocity ratio is 12 : 1. An efficiency of at least 85% is desired. The temperature rise should be restricted to 40 C. Determine the cooling area required.

(25 marks)

3. A general purpose enclosed gear train is based on parallel helical gears, specified life is 36000 hours. torque at driven shaft is 411 Nm. Driving shaft speed is 475 r.p.m. Velocity ratio is 4, it is desired to have standard Centre distance.

(25 marks)

4. (a) What is Lewis (tooth) form factor ? (5 marks)

(b) What are the assumptions made in deriving Lewis equation ? (5 marks)

(c) What are the main types of failures in worm gear drive ? (5 marks)

(d) Helical gear tooth is stronger than spur gear tooth. Why ? (5 marks)

(e) What are the advantages and disadvantages of non-metallic gears ? (5 marks)

[2 × 25 = 50 marks]

Part B

5. (a) A 100 mm diameter full journal bearing supports a radial load of 5 kN the bearing is 100 mm long and the shaft operates at 400 r.p.m. Assume permissible minimum film thickness of 0.025 mm.

Turn over

and diametric clearance of 0.152 mm. using Raimondi and Boyd curves determine : (a) Viscosity of a suitable oil ; (b) Coefficient of friction ; (c) Heat generated ; (d) Amount of oil pumped through the bearing ; (e) Amount of end leakage ; (f) Temperature rise of oil flowing through the bearing.

(20 marks)

(b) What are the desired properties of bearing materials ? Name any *two* of the materials.

(5 marks)

6. (a) Why is preloading of bearings necessary ?   (5 marks)

   (c) What is Sommerfeld number ?   (5 marks)

   (b) SKF 6207 bearing is to operate on the following working cycle. Radial load of 6 KN at 200 r.p.m. for 25% of the time, 9000 N at 500 r.p.m. for 20% of the time and 3 kn at 400 r.p.m. for 55% of the time. The inner ring rotates, the loads are steady. Assuming 1 minute operation and calculate the number of cycles for each load. Find the expected average life of this bearing in hours.

(15 marks)

7. (a) Design a journal bearing for a centrifugal pump running at 1440 r.p.m. Diameter of the journal is 10 cm and load on each bearing is 20 kN and L/D = 1.5 and C/D is 0.001.

(15 marks)

   (b) A ball bearing is subjected to a radial load of 30 kN and a thrust load of 5 kN. The inner ring rotates at 3000 r.p.m. The average life is to be 3000 hours. What basic load rating must be used to select a bearing for this purpose if Fa/Co = 0.3.

(10 marks)

8. Select impeller for a centrifugal pump :

   Discharge = 6000 litres/minute, height of the Centre line of pump above mean level = 3 m, depth of Centre line of pump below delivery point is 6 m, total length of the suction pipe = 20 m, length of the delivery pipe = 60 m, number of bends in suction branch = 1, number of bends in delivery branch = 1, specific speed = 1400 r.p.m. suction pipe diameter =15 cm/delivery pipe diameter = 25 cm/ number of vanes = 8, manometer efficiency = 85%, coefficient of friction = 0.009. Determine :

   (a) total head,

   (b) speed of the impeller ;

   (c) impeller diameters and breadths at inlet and outlet and ;

   (d) inlet and outlet angles of vane.

(25 marks)

[2 × 25 = 50 marks]