MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
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III B. Tech II Sem Supply End Examination, January 2023
Design of Machine Members-II
(Mechanical Engineering)

Time: 3 Hours.   Max. Marks: 70

Note: 1. Question paper consists: Part-A and Part-B.
   2. In Part – A, answer all questions which carries 20 marks.
   3. In Part – B, answer any one question from each unit.
       Each question carries 10 marks and may have a, b as sub questions.

PART- A
(10*2 Marks = 20 Marks)

1. a)	State any two advantages of hydrodynamic bearing over hydrostatic bearing.	2M	CO1	L2
b)	State the properties of sliding contact bearing materials.	2M	CO1	L2
c)	Mention types of antifriction bearings.	2M	CO2	L2
d)	Distinguish between the static load carrying capacity and dynamic load carryingcapacity of ball bearings.	2M	CO2	L3
e)	Enumerate the design considerations for crank pin.	2M	CO3	L3
f)	What are the design requirements of piston?	2M	CO3	L1
g)	Discuss the different types of belts and their material used for power transmission.	2M	CO4	L1
h)	What type of stress is induced in Helical torsion spring?	2M	CO4	L2
i)	What is the relation between the transverse and normal pressure angles and thehelix angles?	2M	CO5	L1
j)	Define (i) Load concentration factor and (ii) Dynamic load factor with respect to spurgears.	2M	CO5	L1

PART- B
(10*5 Marks = 50 Marks)

2 a)	In journal bearing distinguish between bearing characteristics number and bearingmodulus.	5M	CO1	L2
b)	A journal bearing of 75 mm long and 150 mm diameter has diametral clearance of 0.25mm. Journal rotates at 3000 rpm. Compare the power loss and friction torque for SAE10, SAE20 and SAE60 grade oils. Make suitable assumptions. 5 kN radial load is acting on the bearing.	5M	CO1	L3

OR

3	A journal bearing of 50mm diameter and 80mm long, has a bearing pressure of 6 N/mm², the speed of the journal is 1000 rpm. The ratio of journal diameter to the diametral clearance is 1000. The bearing is lubricated with oil, whose absolute viscosity at the operating temperature of 75⁰ C may be taken as 0.015 kg/m-s. The room temperature is 25⁰C, Determine (i) the amount of artificial cooling required and (ii) the mass of the coolant oil required, if the difference between the outlet and inlet temperature of the oil is 10⁰ C. the specific heat of the oil is 1900 J/kg/⁰C and heat dissipation coefficient is 500 W/m2/⁰ C.	10M	CO1	L3

4 a) A single row deep groove ball bearing operating at 2000 r.p.m. is acted by a 10 kNradial load and 8 kN thrust load. The bearing is subjected to a light shock load and theouter ring is rotating. Determine the rating life of the bearing.   5M   CO2   L3

    b) Select appropriate type of rolling contact bearing under the following condition ofloading giving reasons for your choice.
i) Light radial load with high rotational speed.
ii) Heavy axial and radial load with shock.   5M   CO2   L2

OR

5   A single-row deep groove ball bearing is subjected to a pure radial force of 3 kN from ashaft that rotates at 500 rpm. The expected life L_{10h} of the bearing is 30000h. Theminimum acceptable diameter of the shaft is 40 mm. Select a suitable ball bearing forthis application.   10M   CO2   L2

6 a) Explain the design of a centre crankshaft when the crank is at the TDC position, andsubjected to maximum bending moment and no torsional moment.   5M   CO3   L2

    b) Design a suitable connecting rod for a petrol engine for the following data: Diameterof the piston = 100 mm; Weight of reciprocating parts per cylinder = 20N; Connectingrod length = 300 mm; Compression ratio = 7:1; Maximum explosion pressure=$3N/mm^2$; Stroke = 140 mm; Engine speed = 2000 rpm.   5M   CO3   L3

OR

7   Design an aluminum alloy piston for a single acting four stroke engine for thefollowing: Specifications:Cylinder bore =0.30m, Stroke=0.375m, Maximum gas pressure =$8 N/mm^2$Brake mean effective pressure=1.15 MPa, Fuel consumption= 0.22 kg/KW/hr Speed=500 rev/min.   10M   CO3   L3

8 a) Explain the advantages of wire rope drive over belt drive?   5M   CO4   L2

    b) Select a suitable wire rope for a wire hoist carrying a load of 80 kN to be lifted from adepth of 100 m. The speed of 10 m/s should be attained in 10 seconds.   5M   CO4   L2

OR

9   A V – belt drive with the following data transmits power from a motor to compressor. Power transmitted = 100 kW; Speed of the electric motor = 750 rpm; Speed of the Compressor = 300 rpm; Diameter of compressor pulley = 800 mm; Centre distance between pulleys = 1.5 m; Maximum speed of the belt = 30 m/s; Mass density= 900 kg/m^3; Cross sectional area of belt = 350 km^2; Allowable stress in the belt= 2.2 N/mm^2; Groove angle of pulley = 38^0; Coefficient of friction = 0.28. Determine the number of belts required and the length of each belt.   10M   CO4   L3

10 a) What is interference in involute gear? Explain.   5M   CO5   L2

    b) A pair of spur gears must transmit 36 kW from a shaft running at 300 rpm to anothershaft with speed reduction of 3.5:1. The center distance of the shafts is 400 mm. Determine: i) Module and number of teeth on gears ii) Dynamic and wear load.   5M   CO5   L3

OR

11   A pair of spur gears with 20^0 fulldepth involute teeth consist of a 20 teeth pinion meshing with a 41 teeth gear. The module is 3 mm while the face width is 40 mm. The material for pinion as well as gear is steel with an ultimate tensile strength of 600 N/mm^2. The gears are heat-treated to a surface hardness of 400 BHN. The pinion rotates at 1450 rpm and the service factor for the application is 1.75. Assume that velocity factor accounts for the dynamic load and the factor of safety is 1.5.Determine the rated power that the gears can transmit.   10M   CO5   L3

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