



R18 Regulation

Subject code:2P6CA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech VI Semester Supplementary Examinations, December 2024

DESIGN OF MACHINE MEMBERS II (ME)

Maximum Marks: 70

Date:30.12.2024

Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20) Marks)		CO	Bloom Tx
1	What is meant by hydrodynamic lubrication?	1	L1
2	State any four desirable properties of a good bearing material.	1	L1
3	Define Basic static load rating in rolling contact bearings	2	L1
4	Why ball and roller bearings are called 'antifriction' bearings?	2	L1
5	What are the methods and materials used in the manufacture of piston	3	L1
6	Write a short note on piston rings.	3	L1
7	How do you classify the belt drives?	4	L1
8	What type of stress are induced in helical compression spring?	4	L1
9	What is herringbone gear?	5	L1
10	Why the tangential component of gear tooth force is called 'useful' component?	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		CO	Bloom Tx
11	The following data is given for a full hydrodynamic bearing used for electric motor: radial load = 1200 N journal speed = 1440 rpm journal diameter = 50 mm static load on the bearing = 350 N. The values of surface roughness (cla) of the journal and the bearing are 2 and 1 micron respectively. The minimum oil film thickness should be five times the sum of surface roughness of the journal and the bearings. Determine (i) length of the bearing; (ii) radial clearance; (iii) minimum oil film thickness; (iv) viscosity of lubricant; and (v) flow of lubricant. Select a suitable oil for this application assuming the operating temperature as 65°C. [10M]	1	L2
OR			
12	Design a journal bearing for a centrifugal pump with the following data: Diameter of the journal = 150mm Load on bearing = 40KN Speed of journal = 900rpm. [10M]	1	L2
13	A 306 radial ball bearing with inner ring rotation as 8s work cycle as follows Radial force 3KN, Axial load 2KN Speed 1200rp Under steady	2	L2

	load conditions the basic dynamic load capacity of the bearing is 24.25KN. Determine the expected average life of this bearing. Take $X=0.56$ and $Y=1.43$ [10M]		
	OR		
14	Design a self-aligning ball bearings for a radial load of 7000 N and a thrust load of 2100 N. the desired of the bearing is 160 millions of revolutions at 300r.p.m. Assume uniform and steady load. [10M]	2	L2
15	The specifications of high speed petrol engine connecting rod are given as below: Piston diameter = 100mm Stroke length = 125mm Length of the connecting rod=300mm Rated rpm of the engine =1500 Compression ratio = 6:1 Mass of reciprocating parts per cylinder = 2.25kg Speed = 1500rpm Maximum explosion pressure = 3.5Mpa Bearing pressure for big end = 7MPa Bearing pressure for small end = 14MPa Factor of safety=7 Density= 8000kg/m ³ Yield strength in compression 330Mpa. Connecting rod should be of I-section and be made of forged steel, the proportions being depth $h=5t$, width $=4t$, where t is the flange and web thickness. Determine Dimensions of the crank pin & piston pin. [10M]	3	L2
	OR		
16	The following data is given for the piston of a four-stroke diesel engine: Cylinder bore = 250 mm Material of piston rings = Grey cast iron Allowable tensile stress = 100 N/mm ² Allowable radial pressure on cylinder wall = 0.03 MPa Thickness of piston head = 42 mm Number of piston rings = 4 Calculate: (i) radial width of the piston rings; (ii) axial thickness of the piston rings; (iii) gap between the free ends of the piston ring before assembly; (iv) gap between the free ends of the piston ring after assembly;(v) width of the top land; (vi) width of the ring grooves; (vii) thickness of the piston barrel; and (viii) thickness of the barrel at open end. [10M]	3	L2
17	A helical tension spring is used in the spring balance to measure the weights. One end of the spring is attached to the rigid support while the other end, which is free, carries the weights to be measured. The maximum weight attached to the spring balance is 1500 N and the length of the scale should be approximately 100 mm. The spring index can be taken as 6. The spring is made of oil-hardened and tempered steel wire with ultimate tensile strength of 1360 N/mm ² and modulus of rigidity of 81 370 N/mm ² . The permissible shear stress in the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring and calculate (i) wire diameter; (ii) mean coil diameter; (iii) number of active coils; (iv) required spring rate; and (v) actual spring rate. [10M]	4	L2
	OR		
18	A cast iron pulley transmits 20 kW at 300 r.p.m. The diameter of pulley is 550 mm and has four straight arms of elliptical cross-section in which the major axis is twice the minor axis. Find the dimensions of the arm if the allowable bending stress is 15 MPa. Mention the plane in which the major axis of the arm should lie. [10M]	4	L2

19	What should be module, Face width and number of teeth on each pair of spur gears if C45 steel pinion is driving a cast iron gear if they have to transmit 25 KW at 800 rpm of 0.2 meter pinion in continuous service velocity ratio is 3. Gear teeth are 200FDI and load is smooth. [10M]	5	L2
OR			
20	A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 40 teeth gear. The helix angle is 25° and the normal pressure angle is 20° . The normal module is 3 mm. Calculate (i) the transverse module; (ii) the transverse pressure angle; (iii) the axial pitch; (iv) the pitch circle diameters of the pinion and the gear; (v) the centre distance; and (vi) the addendum and dedendum circle diameters of the pinion. [10M]	5	L2

