R20 Regulation *Subject code: 3P6CA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VI Semester Regular/Supplementary Examinations, July 2024

Design of Machine Members-II

(Mechanical Engineering)

Maximum Marks: 70 Date:19.07.2024 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.

Design data book is allowed.

	Part-A		
All the following questions carry equal marks	(10X2M=20 Marks)	CO	Bloom Tx
1	Write the difference between static and dynamic load in rolling contact bearings?	1	L2
2	What is the process of selecting a ball bearing for a specific application?	1	L2
3	List the various types of stresses induced in the connecting rod.	2	L2
4	Why is piston made light weight?	2	L3
5	What is the objective of nipping of leaf springs?	3	L2
6	Define spring index.	3	L1
7	Explain the designation of V-belt with the help of examples.	4	L2
8	What are the advantages of fabric rubber belts?	4	L2
9	State law of gearing.	5	L1
10	What is the relation between the transverse and normal pressure angles and the helix angles?	5	L2
	Part-B		
Answer All the following questions.	(5X10M=50Marks)		
11	A. Explain how the bearing achieves minimal friction and high load capacity through the formation and pressurization of a lubricant film. [5] B. Distinguish between "Hydrodynamic bearing" and "Hydrostatic bearing"? [5]	2	L2 L3
	OR		
12	A shaft rotating at 1440 rpm is supported by two bearings. The forces acting on each bearing are 6000N radial load and 3500 N axial thrust. If the shaft diameter is 40mm and the expected life of the bearing is 500h, select a suitable bearing if the required reliability of the bearing is to be 99percent. [10]	2	L4
13	Design a cast iron piston for a four stroke I.C engine, for the following specifications: Cylinder bore = 120 mm, Stroke length = 150 mm, Maximum gas pressure = 5 MPa, Brake mean effective pressure = 0.7 MPa, Fuel consumption = 0.25 kg/kW/hr, Speed = 2400 r.p.m. Assume any other data necessary for the design. [10]	3	L4
	OR		
14	The following data is given for the connecting rod of a diesel engine: Cylinder bore = 85 mm, Length of connecting rod = 350 mm, Maximum gas pressure = 3 MPa, factor of safety against the buckling failure = 5, l/d ratio for piston pin bearing = 1.5, l/d ratio for crank pin bearing = 1.25, Allowable bearing pressure for piston pin bearing = 13 MPa, Allowable bearing pressure for crankpin bearing = 11 MPa, stroke length = 140 mm,	3	L4

	mass of reciprocating parts = 1.5kg, engine speed = 2000 rpm, allowable stress in the bolts as 90 N/mm^2 and in cap as 95 N/mm^2, density of connecting rod = 7800 kg/m^3 calculate: i)Dimensions of the cross section of connecting rod ii)Dimensions of small and big end bearings iii)Nominal diameter of bolts for the cap iv)Thickness of cap and v)Magnitude of whipping stress [10]		
15	A. A compression spring of spring constant K is cut into two springs having equal number of turns and the two springs are then used in parallel. What is the resulting spring constant of the combination? B. How does the load carrying capacity of the resulting combination compare with that of the original spring? [5+5]	4	L3
	OR		
16	Design a helical compression spring for a maximum load of 1000 N for a deflection of 25 mm using the value of spring index as 5. The maximum permissible shear stress for spring wire is 420 MPa and modulus of rigidity is 84kN/mm2. Take Wahl's factor, $K = \frac{4C-1}{4C-4} + \frac{0.615}{C}$. [10]	4	L4
17	An open belt connects to flat pulleys. The pulley diameter are 300m and 450mm and the corresponding angles of the lap are 1600 and 2100. The smaller pulley runs at 200 r.p.m . The coefficient of friction between pulley and belt is 0.25. It is found that the belt is on the point of slipping when 3 KW is transmitted. To increase the power transmitted two alternatives are suggested, namely (a) increasing the initial tension by 10%, and (b) increasing the coefficient of friction by 10% by the application of a suitable dressing to the belt. [10]	4	L4
	OR		
18	Explain about the open flat belt drive and cross belt drive with neat sketches. [5+5]	4	L2
19	Design a pair of spur gear with stub teeth to transmit 55kW from 175 mm pinion running at 2500 rpm to a gear running at 1500 rpm. Both the gears are made of steel having B.H.N 260. Approximate the pitch by means of Lewis equation and then adjust the dimensions to keep within the limits set by the dynamic load and wear equation. [10]	5	L4
	OR		
20	Explain about the Spur gear with neat sketch along with nomenclatures. [10]	5	L2