R20 Regulation *Subject code:3P6CA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VI Semester Supplementary Examinations, May 2025

DESIGN OF MACHINE MEMBERS -II

(ME)

Maximum Marks: 70 Date: 16.06.2025 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.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

DATA BOOKS ALLOWED

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	Write the classifications and different types of antifriction bearings.	2M	1	L1
2	Define Basic static load rating in rolling contact bearings	2M	1	L1
3	At what angle of the crank the twisting moment is maximum in the crank shaft?	2M	2	L1
4	State the function of the ribs for an IC engine piston	2M	2	L1
5	What are the uses and construction of wire ropes?	2M	3	L1
6	Write the relation for the ratio of driving tensions of a V-belt.	2M	3	L1
7	List the advantages and disadvantages of V-belt drive over flat belt drive?	2M	4	L1
8	Write design procedure for spur gears	2M	4	L1
9	Derive equation for formative number of teeth in helical gears?	2M	5	L1
10	Why is the pinion weaker than the gear made of same material?	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	A 150mm diameter shaft supporting a load of 10KN has a speed of 1500rpm.The shaft run in whose bearing length is 1.5 times the shaft diameter. If the diametric clearance of bearing is 0.15mm and the absolute viscosity of the oil at the operating temperature is 0.011 Kg/m-s. Find the power wasted in friction.	10M	1	L2
	OR			
12	A full journal bearing of 50mm diameter and 100mm long has a bearing pressure of 1.4N/mm2• The speed of the journal is 900rpm and the ratio of journal diameter to the diametric clearance is 1000. The bearing is lubricated with oil, whose absolute viscosity at the operating temperature of 75°C may be taken as 0.011 kg/m-s. The room temperature is 350C.Find, (1)The amount of artificial cooling required. (2)The mass of lubricating oilrequired, if the difference between the outlet and inlet temperature of the oilis 10°C. Take specific heat of oil as 1850J/Kg/0C.	10M	1	L2

13	Select a single row deep groove ball bearing for a radial load of 4000 N and an axial load of 5000 N, operating at a speed of 1600 r.p.m. for an average life of 5 years at 10 hours per day. Assume uniform and steady load.	10M	2	L2
	OR			
14	The rolling contact ball bearing are to be selected to support the overhung countershaft. The shaft speed is 720 r.p.m. The bearings are to have 99% reliability corresponding to a life of 24 000 hours. The bearing is subjected to an equivalent radial load of 1 kN. Consider life adjustment factors for operating condition and material as 0.9 and 0.85 respectively. Find the basic dynamic load rating of the bearing from manufacturer's catalogue, specified at 90% reliability.	10M	2	L2
15	Design a cast iron piston for a single acting four stroke engine for the following data: Cylinder bore = 100 mm ; Stroke = 125 mm ; Maximum gas pressure = 5 N/mm2 ; Indicated mean effective pressure = 0.75 N/mm2 ; Mechanical efficiency = 80% ; Fuel consumption = 0.15 kg per brake power per hour ; Higher calorific value of fuel = 42 × 103 kJ/kg ; Speed = 2000 r.p.m. Any other data required for the design may be assumed.	10M	3	L2
	OR			
16	Design a connecting rod for an I.C. engine running at 1800 r.p.m. and developing a maximum pressure of 3.15 N/mm2. The diameter of the piston is 100 mm ; mass of the reciprocating parts per cylinder 2.25 kg; length of connecting rod 380 mm; stroke of piston 190 mm and compression ratio 6 : 1. Take a factor of safety of 6 for the design. Take length to diameter ratio for big end bearing as 1.3 and small end bearing as 2 and the corresponding bearing pressures as 10 N/mm2 and 15 N/mm2. The density of material of the rod may be taken as 8000 kg/m3 and the allowable stress in the bolts as 60 N/mm2 and in cap as 80 N/mm2. The rod is to be of I-section for which you can choose your own proportions. Draw a neat dimensioned sketch showing provision for lubrication. Use Rankine formula for which the numerator constant may be taken as 320 N/mm2 and the denominator constant 1 / 7500.	10M	3	L2
17	Design a belt drive pulley for transmitting 15kW at 280 rpm. The velocity of the belt is not to exceed 10m/s, and the maximum tension is not to exceed 15N/mm width. The tension on the slack is one half of that on the tight side. Determine: a.Width of the pulley b.Diameter of the pulley.	10M	4	L2
	OR			
18	Design a leaf spring for the following specifications: Total load = 140 kN; Number of springs supporting the load = 4; Maximum number of leaves = 10; Span of the spring = 1000 mm; Permissible deflection = 80 mm. Take Young's modulus, E = 200 kN/mm2 and allowable stress in spring material as 600 MPa.	10M	4	L2

19	A pair of helical gears are to transmit 15 kW. The teeth are 20° stub in diametral plane and have a helix angle of 45°. The pinion runs at 10 000 r.p.m. and has 80 mm pitch diameter. The gear has 320 mm pitch diameter. If the gears are made of cast steel having allowable static strength of 100 MPa; determine a suitable module and face width from static strength considerations and check the gears for wear, given (σ) es = 618 MPa	10M	5	L2
	OR			
20	The following particulars of a single reduction spur gear are given, Gear ratio=10:1; Distance between centers =660mm approximately; pinion transmits 500kw at 1800rpm; Involutes teeth of standard proportions (addendum=1m) with pressure angle of 22.50; Permissible normal pressure between teeth =175N per mm of width. Find: i. The nearest standard module if no interference is to occur. ii. The number of teeth on wheel; iii. The necessary width of pinion iv. The load on the bearings of the wheels due to power transmitted.	10M	5	L2