R20 Regulation *Subject code: 3P6CA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VI Semester Supplementary Examinations, April 2026

DESIGN OF MACHINE MEMBERS -II

(ME)

Maximum Marks: 70 Date: 13.04.2026 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.

DMM Data book allowed

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	Write 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	What are the methods and materials used in the manufacture of piston	2M	2	L1
5	State the advantages and disadvantages of the chain drive over belt and rope drive	2M	3	L1
6	Write the relation for the ratio of driving tensions of a V-belt.	2M	3	L1
7	Write design procedure for spur gears	2M	4	L1
8	Derive equation for formative number of teeth in helical gears?	2M	4	L1
9	Write a short notes on design of springs	2M	5	L1
10	List classification of springs	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	A shaft rotating at constant speed is subjected to variable load. The bearings supporting the shaft are subjected to stationary equivalent radial load of 3 kN for 10 per cent of time,2 kN for 20 per cent of time, 1 kN for 30 per cent of time and no load for remaining time of cycle. Ifthe total life expected for the bearing is 20 × 106 revolutions at 95 per cent reliability, calculate dynamic load rating of the ball bearing	10M	2	L2
15	Design a connecting rod for an I.C. engine running at 1800 r.p.m. and developing a maximum pressure of 3.15 N/mm^2. 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/mm^2 and 15 N/mm^2. The density of material of the rod may be taken as 8000 kg/m^3 and the allowable stress in the bolts as 60 N/mm^2 and in cap as 80 N/mm^2. The rod is to be of I-section for which you can choose your own proportions.	10M	3	L2
	OR			
16	Draw a neat dimensioned sketch showing provision for lubrication. Use Rankine formula for which the numerator constant may be taken as 320 N/mm^2 and the denominator constant	10M	3	L2
17	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 84 kN/mm^2.	10M	4	L2
	OR			
18	A pump is driven by an electric motor through a open type flat belt drive. Determine the belt specifications for the following data. Motor pulley diameter(d_S) = 300 mm, Pump pulley diameter(d_L) =600 mm Coefficient of friction (μ_S) for motor pulley = 0.25 Coefficient of friction (μ_L) for pump pulley =0.20 Center distance between the pulleys=1000 mm; Rotational speed of the motor=1440 rpm; Power transmission = 20kW; density of belt material (ρ)= 1000 kg/m^3 ; allowable stress for the belt material (σ) = 2 MPa; thickness of the belt = 5mm.	10M	4	L2
19	A gear drive is required to transmit a maximum power of 22.5 kW. The velocity ratio is 1:2 and r.p.m. of the pinion is 200. The approximate centre distance between the shafts may be taken as 600 mm. The teeth has 20°	10M	5	L2

	stub involute profiles. The static stress for the gear material (which is cast iron) may be taken as 60 MPa and face width as 10 times the module. Find the module, face width and number of teeth on each gear. Check the design for dynamic and wear loads. The deformation or dynamic factor in the Buckingham equation may be taken as 80 and the material combination factor for the wear as 1.4. .			
	OR			
20	A pair of 20° full depth involute teeth bevel gears connect two shafts at right angles having velocity ratio 3 : 1. The gear is made of cast steel having allowable static stress as 70 MPa and the pinion is of steel with allowable static stress as 100 MPa. The pinion transmits 37.5 kW at 750 r.p.m. Determine : 1. Module and face width; 2. Pitch diameters; and 3. Pinion shaft diameter. Assume tooth form factor, $y = 0.154 - 0.912$, where T is the formative number of teeth, width = 1/3 rd the length	10M	5	L2