



R20 Regulation

Subject code: 3P6CA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VI Semester Supplementary Examinations, November 2025

DESIGN OF MACHINE MEMBERS -II

(ME)

Maximum Marks: 70

Date: 19.11.2025

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 BOOK ALLOWED.

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	State any four desirable properties of a good bearing material.	2M	1	L1
2	Why are taper roller bearings used in pairs?	2M	1	L1
3	Write short note on classifications of antifriction bearings.	2M	2	L1
4	What are the materials used in the manufacture of crankshafts?	2M	2	L1
5	How do you classify springs and name them?	2M	3	L1
6	What are the forces that act on the piston head of an internal combustion engine	2M	3	L1
7	What are 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	Write equation for formative number of teeth in helical gears.	2M	5	L1
10	Write about design of springs.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	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
OR				
12	A 150mm diameter shaft supporting a load of 10KN has a speed of 1500rpm. The shaft runs 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
13	A ball bearing subjected to a radial load of 8000N is expected to have a satisfactory life of 8000 hours at 2450r.p.m with a reliability of 97%. Calculate the dynamic load capacity of the bearing.	10M	2	L2
OR				
14	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

15	A four-stroke diesel engine has the following specifications: Brake power = 5 kW ; Speed = 1200 r.p.m. ; Indicated mean effective pressure=0.35N/ mm ² ; Mechanical efficiency = 80 %. Determine: 1. bore and length of the cylinder 2. thickness of the cylinder head 3. size of studs for the cylinder head	10M	3	L2
OR				
16	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/mm ² ; Indicated mean effective pressure = 0.75 N/mm ² ; Mechanical efficiency = 80% ; Fuel consumption = 0.15 kg per brake power per hour ; Higher calorific value of fuel = 42 × 10 ³ kJ/kg ; Speed = 2000 r.p.m. Any other data required for the design may be assumed.	10M	3	L2
17	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
OR				
18	The spring loaded safety valve for a boiler is required to blow off at a pressure of 10 kg/sq cm. The diameter of the valve is 6 cm, and the maximum lift of the valve is 1.5 cm. Design the suitable compression spring for the safety valve assuming the spring index to be 6 and providing initial compression of 3 cm. The maximum shear stress in the material of the wire is limited to 4,500 kg/sq cm. G = 0.84 x 10 Kg/Sq cm.	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; Involute 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