



R20 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VI Semester Regular Examinations, June/July 2023

Subject code: 3P6CA

DESIGN OF MACHINE MEMBERS - II

(Mechanical Engineering)

Maximum Marks: 70

Date: 22.06.2023 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

- 1 Classify Antifriction Bearings. (10x2M=20 Marks)
2 Explain briefly about the static loading of Ball and Roller Bearing.
3 Explain the various stresses induced in the connecting rod.
4 What are the different types of Crank shafts?
5 What is the function of spring? In which type of spring the behavior is non linear?
6 Write the applications of helical torsion springs?
7 What is the selection criterion for Rope Drives?
8 Mention limitations of Belt drives.
9 What is law of gearing?
10 What is the relation between the transverse and normal pressure angles and the helix angles?

Part-B

Answer All the following questions.

*O = 75 mm
W = 10kN
N = 1440 rpm*

(5X10M=50Marks)

- 11 Design a full hydro dynamic journal bearing with following specifications for machine tool applications: Journal diameter = 75mm, radial load = 10kN, journal speed = 1440 rpm, minimum film thickness = 22.5 microns, inlet temperature = 40° C, bearing material = babbitt. Determine the length of bearing and select suitable oil for this application. (10M)

OR

- 12 A rolling contact bearing is subjected to the following work cycle : (a) Radial load of 6000 N at 150 r.p.m. for 25% of the time; (b) Radial load of 7500 N at 600 r.p.m. for 20% of the time; and (c) Radial load of 2000 N at 300 r.p.m. for 55% of the time. The inner ring rotates and loads are steady. Select a bearing for an expected average life of 2500 hours. (10M)

- 13 A. Write a design procedure of a piston for an I C Engine. (5M)
B. Explain the construction of Piston. (5M)

OR

- 14 The following is the data for a 4-stroke diesel engine.
Cylinder bore = 100mm, maximum gas pressure = 5 MPa, Allowable bearing pressure for piston skirt = 0.5 MPa, side thrust on liner to maximum gas load on piston ratio = 0.1, width of top land = 18 mm, width of ring grooves = 2.5 mm, number of piston rings = 4, axial thickness of piston rings = 3mm. Determine the length of skirt and length of piston. (10M)

*OJ = 41.44 mm
W = 0.04 X 1000 = 400 mm
OJ = 1.03 X 41.44*
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- 15 A helical compression spring made of oil tempered carbon steel is subjected to a load which varies from 400N to 1000N. The spring index is 6 and the design factor of safety is 1.25. If the yield stress in shear is 770MPa and endurance stress in shear is 350MPa. Find i) Size of spring wire, ii) Diameters of the spring, iii) Number of turns of the spring, iv) free length of spring. The compression of the spring at the maximum load is 30mm. The modulus of rigidity for the spring material may be taken as 80 kN/mm^2 . (10M)

- 16 At the bottom of an elevator shaft a group of 8 identical springs are set in Parallel to absorb the shock of the elevator in the case of failure. The elevator Weighs 40 kN. Assuming the elevator has a free fall of 1.5 m from rest; determine the maximum stress in each spring which is made of 30 mm diameter rod. For each spring, the spring index is 8 and the number of active coils is 12. Take $G=83 \text{ GN/m}^2$. (10M)

- 17 A. Discuss about the various types of belt drives with neat sketches? (7M)
B. What are the applications of chain drives? (3M)

OR

- 18 Find the width of a Flat belt required to transmit 12 kW at 1600 rpm of motor. The diameter of smaller pulley is 120 mm and that of driven pulley is 300 mm. The angle of contact on smaller pulley is 2.9 radians and larger pulley is 3.38 radians. The coefficient of friction on smaller pulley is 0.4 and for larger pulley is 0.3. The belt used is 8 mm thick and weighs 10 KN/m^2 . Allowable tension in belt is 1.75 MPa. (10M)

- 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. (10M)

OR

- 20 Why dynamic load is induced in the gear teeth? Explain the procedure of designing the dynamic load using Buckingham equation. (10M)

NOTE: Design date book permitted to examination.

$$T = \frac{P \times 60}{2\pi N}$$

$$T_P = \frac{DP}{m}$$

$$V = \frac{\pi D_1 N_1}{60}$$

$$VR = \frac{D_2}{D_1}$$

$$Q = \frac{24 V T}{V R + 1}$$

$$\omega = \frac{T}{D P / 2}$$

$$T_C = \frac{T_P}{cos 30}$$

$$b = 1.5$$

$$28.30$$

$$w_w = \frac{D_P \times Q}{cos 30}$$