Regulation R17

Subject code: 1P6CB

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech III Year II Semester Supplementary Examinations, June/July 2023

DESIGN OF MACHINE MEMBERS-II
MECHANICAL ENGINEERING

Maximum Marks: 70

Date:24.06.2023 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.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

DESIGN DATA BOOKS ARE ALLOWED

Part-A

All the following questions carry equal marks (10x2M=20 Marks)

1 What is meant by hydrodynamic lubrication?
2 Write the Bearing characteristic number for journal bearings
3 Write the design of piston for an internal combustion engine
4 Write a short note on piston rings.
5 Write about the various types of belt drives with neat sketches?
6 On what factors does the power transmitted by a belts depends?
7 Write the design procedure of spur gears?
8 Write the Lewis equation for beam strength of gear tooth on spur gears
9 Write a short notes on design of springs?
10 What are the classification of springs?

Part-B

Answer All the following questions. (10M X 5=50Marks)

11 The load on the journal bearing is 150 KN due to turbine shaft of 300 mm diameter running at 1800 r.p.m. Determine the following : 1. Length of the bearing if the allowable bearings pressure is 1.6 N/mm2, and
Amount of heat to be removed by the lubricant per minute if the bearing temperature is 600C and viscosity of the oil at 600C is 0.02 kg/ms and the bearing clearance is 0.25 mm 10

OR

12 A 80 mm long journal bearing supports a load of 2800 N on a 50 mm diameter shaft. The bearing has a radial clearance of 0.05 mm and the viscosity of the oil is 0.021 kg/ms at the operating temperature. If the bearing is capable of dissipating 80 J/s, determine the maximum safe speed 10

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. 10

OR

14 The rolling contact ball bearings are to be selected to support the overhung countershaft. The shaft speed is 720r.p.m. The bearings are to have 99% reliability corresponding to a life of 24000 hours. The bearing is subjected to an equivalent radial load of 1kN. 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 manufacture's catalogue, specified at 90% reliability. 10

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/mm2. The diameter of the piston is 100 mm; mass of the reciprocating parts per cylinder 2.25kg; 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 10N/mm2 and 15 N/mm2. The density of material of the rod may be taken as 8000kg/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.. Use Rankine formula for which the numerator constant may be taken as 320 N/mm2 and the denominator 1/7500. 10

OR

16 Design a cast iron piston for a single acting four stroke engine for the following data: Cylinder bore = 100mm; Stroke = 125mm; Maximum gas pressure = 5N/mm2; Indicated mean effective pressure = 0.75 N/mm2; Mechanical efficiency = 80%; Fuel consumption =0.15kg per brake power per hour; Higher calorific value of fuel =42 x 103 kJ/kg; Speed = 2000r.p.m. Any other data required for the design may be assumed. 10

17 Design a leaf spring for the following specifications
Total load = 140 kN, number of springs supporting the load = 4, maximum numbers of leaves = 10, span of the spring = 1000 mm, permissible deflection = 80 mm,. Take young's modulus, E = 200 KN/ mm^2, and allowable stress in spring material as 600 MPa. 10

OR

18 A belt, 100 x 10mm is transmitting power at 15m/s. the angle of contact on the driver (smaller) pulley is 1560, if the permissible stress for the belt material is 2N/mm2; determine the power that can be transmitted at this speed. Tale the density of leather as 1000kg/m3 and coefficient of friction as 0.25. Calculate the maximum power that can be transmitted 10

19 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 10
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

OR

20 A pair of helical gears is to transmit 15KW. The teeth are 200 stub in diametric plane and have a helix angle of 450. The pinion runs at 10,000rpm and has 8mm pitch diameter. The gear has 320mm pitch diameter. If the gears are made of cast steel having allowable static strength of 100Mpa.Determine a suitable module and face width from static strength considerations. 10