Regulation R17 *Subject code:* 1P6CB

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Year II Semester Regular Examinations, October 2020

Design of Machine Members - II

(Mechanical Engineering)

Maximum Marks: 70 Date: 29.10.2020 **Duration: 2 Hours**

Note: Allowed Design Data book/Hand book

Design components for both strength and rigidity.

Part-A

All the following questions carry equal marks **(10x1M=10 Marks)**

1 Why hydrostatic bearing is called 'externally pressurized' bearing?
2 Write down the expression for Sommerfeld's number
3 Define Basic static load rating in rolling contact bearings
4 Define rating life of bearing
5 Name the the forces that act on the piston head of an internal combustion engine
6 At what angle of the crank the twisting moment is maximum in the crank shaft?
7 Define velocity ratio in a belt drive
8 What type of stress is induced in helical compression spring?
9 Why the tangential component of gear tooth force is called 'useful' component?
10 State any two applications of gear drives.

Part-B

Answer **ANY FIVE QUESTIONS** **(12MX 5=60Marks)**

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/mm^2, and Amount of heat to be removed by the lubricant per minute if the bearing temperature is 60^0C and viscosity of the oil at 60^0C is 0.02 kg/ms and the bearing clearance is 0.25 mm.

12 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.

13 A ball bearing subjected to a radial load of 5000N is expected to have a satisfactory life of 8000 hours at 1450r.p.m with a reliability of 99%.Calculate the dynamic load capacity of the bearing.

14 A 306 radial ball bearing with inner ring rotation has work cycle as follows Radial force 3KN , Axial load 2KN Speed 1250rpm. Under steady load conditions the basic dynamic load capacity of the bearing is 24.25KN. Determine the expected average life of this bearing. Take X=0.56 and Y=1.43.

15 Determine the dimensions of cross-section of the connecting rod for a diesel engine with the following data: Cylinder bore = 100 mm Length of connecting rod = 350 mm Maximum gas pressure = 4 MPa Factor of safety = 6.

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 = Indicated mean effective pressure = 0.75 N/mm^2; $5N/mm^2$; mechanical efficiency = 80%; Fuel consumption =0.15kg per brake power per hour; Higher calorific value of fuel =42 x 10^3 kJ/kg; Speed = 2000r.p.m. Any other data required for the design may be assumed.

17 It is required to design a helical compression spring subjected to a maximum force of 1250 N. The deflection of the spring corresponding to the maximum force should be approximately 30 mm. The spring index can be taken as 6. The spring is made of patented and cold-drawn steel wire. The ultimate tensile strength and modulus of rigidity of the spring material are 1090 and 81 370 N/mm^2 respectively. The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring and calculate: (i) wire diameter; (ii) mean coil diameter; (iii) number of active coils; (iv) total number of coils; and (v) free length of the spring.

18 Design a belt drive pulley for transmitting 10kW at 180 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.

19 A pair of helical gears is to transmit 18KW. The teeth are 20^0 stub in diametric plane and have a helix angle of 35^0. The pinion runs at 8000rpm and has 6mm pitch diameter. The gear has 320mm pitch diameter. If the gears are made of cast steel having allowable static strength of 150Mpa.Determine a suitable module and face width from static strength considerations.

20 What should be the module, Face width and number of teeth on each pair of spur gears if C45 steel pinion is driving a cast iron gear. If they have to transmit 25 KW at 800 rpm of 0.2 meter pinion in continuous service velocity ratio is 3. Gear teeth are 200 FDI and load is smooth.