PVP 14

Code: ME6T2

III B.Tech - II Semester – Regular/Supplementary Examinations
AUGUST 2021

DESIGN OF MACHINE MEMBERS-II
(MECHANICAL ENGINEERING)

Design data books are allowed.

Assume any missing data appropriately and state it clearly.

Duration: 3 hours Max. Marks: 70

PART – A

Answer *all* the questions. All questions carry equal marks

11x 2 = 22 M

1.

a) Why hollow shaft is preferred over solid shaft?
b) What is the effect of keyways cut into the shaft?
c) How is Journal bearings classified?
d) Define rating life, minimum life.
e) What do you mean by flexible drives? What are the limitations they offer over gears?
f) State the advantages and disadvantages of the chain drive over belt drive.
g) What are the various forms of threads used in power screws and state their significance.
h) How wire ropes are designated?
i) What is self locking property of threads?
j) Define the following terms related to spur gears
i) pressure angle ii) Diametral pitch.
k) Briefly explain how axial thrust is eliminated in herringbone gears?

PART – B

Answer any *THREE* questions. All questions carry equal marks.
3 x 16 = 48 M

2. a) Compare the resistance to torsion of a hollow shaft to that of a solid shaft, if the inside diameter of the hollow shaft is two thirds of the external diameter and the two shafts have the same material, weight and of equal length. 4 M

b) Design a bushed pin type of flexible coupling for connecting a motor and a pump shaft. The following data is provided, Power transmitted 20kW, Speed 1000 r.p.m. , diameter of pump and motor shafts 50 mm. Allowable bearing pressure in the bush is 0.3 MPa 12 M

3. a) Explain McKee's investigation on bearing characteristic number, bearing modulus and coefficient of friction. 6 M

b) The ball bearings are to be selected for an application in which the radial load is 2000N during 90% of the time and 8000N during the remaining 10%. The shaft is to rotate at 150 r.p.m. Determine the minimum value of the basic dynamic load rating for 5000 hours of operation with not more than10 percent failures. 10 M

4. a) Design a chain drive to transmit power of 15kW from a electric motor. The speed of the motor shaft is 970 r.p.m

and compressor is to be run at 330 r.p.m. Compressor operates 16 hrs per day, the minimum centre distance should be 550mm. 9 M

b) Power is transmitted between two shafts by a V-belt whose mass is 0.9 kg/m length. The maximum permissible tension in the belt is limited to 2.2 kN. The angle of lap is 170^0 and the groove angle is 45^0. If the coefficient of friction between the belt and pulleys is 0.17, then find (i) velocity of the belt for maximum power, (ii) power transmitted at this velocity. 7 M

5. Design and draw a screw jack for lifting a safe load of 150 kN through a maximum lift of 350 mm. The elastic strength of the material of the screw may be taken as 240 MPa in compression and 160 MPa in shear. The nut is to be made of phosphor bronze for which the elastic strengths in tension, compression and shear are respectively 130, 115, 100 MPa. Bearing pressure between the threads of the screw and the nut may be taken as 18 N/mm^2. Safe crushing stress for the material of the body is 100 MPa. Coefficient of friction for the screw as well as collar may be taken as 0.15. 16 M

6. A pair of helical gears consists of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20^0 while the helix angle is 25^0. The face width is 40 mm and the normal module is 4 mm.

The pinion as well as gear is made of steel having ultimate strength of 600 MPa and heat treated to a surface hardness of 300 BHN. The service factor and factor of safety are 1.5 and 2 respectively. Assume that the velocity factor accounts for the dynamic load and evaluate the power transmitting capacity of the gears. 16 M