Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech (ME) (Sem.–6)

MACHINE DESIGN-II

Subject Code : ME-302

Paper ID : [A0819]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) What do you understand by simplex, duplex and triplex chains?

b) What is the relation for the ratio of driving tensions of a V-belt?

c) What is buckling of springs?

d) What is surge in springs?

e) What are the types of journal bearing depending upon the nature of lubrication?

f) How does the function of flywheel differ from that of governor?

g) What are the differences between helical torsion spring and tension helical springs?

h) State the type of stresses induced in a rim flywheel?

i) What is meant by CAD and CAM?

j) In the context of wire rope explain the meaning of 6 × 19.

SECTION-B

2. Design a cast iron driven pulley to transmit 20 kW at 300 r.p.m. The diameter of the pulley is 500 mm and the angle of lap is 180°. The pulley has four arms of elliptical cross-section with major axis twice the minor axis. The coefficient of friction between the belt and the pulley surface is 0.3. The allowable tension per metre width of the belt is 2.5 N. The following allowable stresses may be taken : Shear stress for the shaft material = 50 MPa, and Bending stress for the pulley arms =15 MPa.

3. A journal bearing has a shaft diameter of 75.00 mm with a unilateral tolerance of –0.02 mm. The bushing bore has a diameter of 75.10 mm with a unilateral tolerance of 0.06 mm. The bushing is 36 mm long and supports a load of 2 kN. The journal speed is 720 rev/min. For the minimum clearance assembly find the minimum film thickness, the heat loss rate, and the maximum lubricant pressure for SAE 20 and SAE 40 lubricants operating at an average film temperature of 60°C.

4. A double threaded worm drive has an axial pitch of 25 mm and a pitch circle diameter of 70 mm. The torque on the Worm gear shaft is 1400 N-m. The pitch circle diameter of the worm gear is 250 mm and the tooth pressure angle is 25°. Find: 1. tangential force on the worm gear, 2. torque on the worm shaft, 3. separating force on the worm, 4. velocity ratio, and 5. efficiency of the drive, if the coefficient of friction between the worm thread and gear teeth is 0.04.

5. Design a chain drive to run a blower at 600 r.p.m. The power to the blower is available from a 8 kW motor at 1500 r.p.m. The centre distance is to be kept at 800 mm,

6. A rope drive is required to transmit 750 kW from a pulley of 1 m diameter running at 450 r.p.m. The safe pull in each rope is 2250 N and the mass of the rope is 1 kg / m length. The angle of lap and the groove angle is 150° and 45° respectively. Find the number of ropes required for the drive if the coefficient of friction between the rope and the pulley is 0.3.

SECTION-C

7. A belt 100 mm wide and 10 mm thick is transmitting power at 1000 metres/min. The net driving tension is 1.8 times the tension on the slack side. If the safe permissible stress on the belt section in 1.6 MPa, calculate the maximum power that can be transmitted at this speed. Assume density of the leather as 1000 kg/m^3. Calculate the absolute maximum power that can be transmitted by this belt and the speed at which this can be transmitted.

8. A laminated semi elliptic spring under a central load of 12KN is to have an effective length of lm and is not allowed to deflect more than 75 mm. The spring has 10 leaves, 2 of which are full length and are pre-stressed so that all the leaves have same stress after the full load is applied. All the leaves have same width and thickness. The maximum stress in the leaves is not to exceed 350 MPa. Find the width and thickness of plates. Assume that for spring material E= 200 GPa.

9. A 900 bevel gearing arrangement is to be employed to transmit 4 kW at 600 r.p.m. from the driving shaft to another shaft at 200 r.p.m. The pinion has 30 teeth. The pinion is made of cast steel having a static stress of 80 MPa and the gear is made of cast iron with a static stress of 55 MPa. The tooth profiles of the gears are of composite form. The tooth form factor may be taken as $y' = 0.124 – 0.684 / T_E$, where T_E is the formative number of teeth and velocity factor, Cv = 3/3 + v, where v is the pitch line speed in m/s. The face width may be taken as l/3rd of the slant height of the pitch cone. Determine the module, face width, pitch diameters for the pinion and gears, from the standpoint of strength, and check the design from the standpoint of wear. Take surface endurance limit as 630 MPa and modulus of elasticity for the material of gears is E_P = 200 kN/mm^2 and E_G = 80 kN/mm^2.