

Exam. Code: 0942

Sub. Code: 6730 ✓

2054

B.E. (Mechanical Engineering)

Sixth Semester

MEC-601: Design of Machines Elements – II ✓

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part. Assume any suitable missing data wherever required.

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Q1a) Sketch the cross-section of flat and V-belts.

b) What is chordal action

c) What is Wahl's stress factor

d) Define basic dynamic load rating of rolling contact bearings

e) What are self locking brakes.

(10)

Part-A

Q2a) Write the design procedure of flat belt.

(4)

b) A compressor is to be actuated from a 10 kW electric motor. The speed of motor shaft is 970 rev/mint and that of compressor is to be 330 rev/mint. The compressor operates in two shifts. The minimum centre distance should be 550 mm. Select a suitable chain drive. (6)

Q3a) Write the design procedure for spur gear.

(4)

b) A pair of helical gears are to transmit 15 kW. The teeth are 20° stub in diametral plane and have a helix angle of 45°. The pinion runs at 10000 r.p.m. and has 80 mm pitch diameter. The gear has 320 mm pitch diameter. If the gears are made of cast steel having allowable static strength of 100 MPa; determine a suitable module and face width from static strength considerations and check the gears for wear, given $\sigma_{es} = 618$ MPa (6)

Q4a) What are the various stresses in helical compression springs.

(2)

b) A safety valve of 60 mm diameter is to blow off at a pressure of 1.2 N/mm². It is held on its seat by a close coiled helical spring. The maximum lift of the valve is 10 mm. Design a suitable compression spring of spring index 5 and providing an initial compression of 35 mm. The maximum shear stress in the material of the wire is limited to 500 MPa. The modulus of rigidity for the spring material is 80 kN/mm². Calculate: 1. Diameter of the spring wire, 2. Mean coil diameter, 3. Number of active turns, and 4. Pitch of the coil. (8)

P.T.O.

(2)

Part-B

- Q5) Design a full hydrodynamic journal bearing with following specification for machine tool application:
Journal diameter = 75 mm, Radial load = 10 kN, Journal speed = 1440 rpm, Minimum oil film thickness = 22.5 microns, Inlet temperature = 40°C, Bearing material = Babbitt. (10)
- Q6a) What are the advantages and disadvantages of rolling contact bearings over sliding contact bearings. (4)
- b) A shaft rotating at constant speed is subjected to variable load. The bearings supporting the shaft are subjected to stationary equivalent radial load of 3 kN for 10 per cent of time, 2 kN for 20 per cent of time, 1 kN for 30 per cent of time and no load for remaining time of cycle. If the total life expected for the bearing is 20×10^6 revolutions at 95 per cent reliability, Calculate dynamic load rating of the ball bearing. (6)
- Q7 a) Classify different types of brakes. (2)
- b) A single dry plate clutch is to be designed to transmit 7.5 kW at 900 r.p.m. Find :
1. Diameter of the shaft,
 2. Mean radius and face width of the friction lining assuming the ratio of the mean radius to the face width as 4,
 3. Outer and inner radii of the clutch plate, and
 4. Dimensions of the spring, assuming that the number of springs are 6 and spring index = 6.
- The allowable shear stress for the spring wire may be taken as 420 MPa. (8)

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