B.Tech.(ME) (2011 Onwards)   (Sem.–6)
# DESIGN OF MACHINE ELEMENTS – II
Subject Code : BTME-601
Paper ID : [A2361]

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 SIX questions carrying TEN marks each and students has to attempt any FOUR questions.**
3. **Assume any missing data suitably. Design data book compiled by PSG College of Engineering & Tech. Coimbatore is allowed in examination.**

SECTION-A

1. **Write briefly :**

   i)   Distinguish between 'Hydro-dynamic bearings' and 'Hydro-static bearings'.

   ii)   Define 'Bearing Modulus'.

   iii) What is the effect of pre-loading of tension springs?

   iv)   List the advantages and disadvantages of Worm Gear drives.

   v)   What is the effect of centre distance and pulley size, on the life of a belt?

   vi)   *'Chain drive has some features of belt drive, and some of the gear drive'.* Explain.

   vii) Describe a band brake.

   viii) What is a positive clutch?

   ix)   What is a function of a flywheel?

   x)   Discuss about the various types of stresses induced in a flywheel rim.

SECTION-B

2. Design a helical tension spring for a spring loaded safety valve so as to meet the following requirements :

   Diameter of valve seat = 70 mm

   Operating pressure(when valve begin to lift) = 0.7 N/mm^2

   Maximum pressure(when valve blow of freely) = 0.75 N/mm^2

   Lift a valve during change of pressure = 4mm

   Permissible shear stress, τ = 560 MPa.

   Take G = 0.84×10^5 MPa, and C=6

3. A journal bearing of 50 mm diameter and 80 mm long, has a bearing pressure of 6 N/mm^2. The speed of journal is 1000 rpm. The ratio of journal diameter to the diametric clearance is 1000. The bearing is lubricated with oil, whose absolute viscosity at the operating temperature of 75°C may be taken as 0.015 kg/m-s. The room temperature is 25°C. Determine

   i. The amount of artificial cooling required

   ii. The mass of the coolant oil required, if the difference between the outlet and inlet temperature of oil is 10°C. The specific heat of oil is 1900 J/kg/°C and heat dissipation coefficient is 500W/m^2/°C.

4. Design a wire rope for a vertical mine hoist to lift a load of 50 kN, from a depth of 250 m. Rope speed of 8 m/s is to be attained in 10 seconds. Take Factor of Safety as 6.

5. A cast steel spur pinion (σ_d= 200 MPa) running at 450 rpm transmits 20 kW power to a cast iron gear (σ_d = 80 MPa) running at approximately 112 *rpm*. The load is steady. Design the drive and check for dynamic and wear loads.

6. A single cylinder 4-stroke IC engine develops 20 kW at 240 *rpm*. The work done by the gases during expansion stroke is 2.5 times the work done on the gases during the compression stroke; the work done during the suction and exhaust strokes being negligible. If the total fluctuation of speed is not to exceed ±2% of the mean speed, and the turning moment diagram during compression and expansion is assumed to be triangular in shape. Determine the moment of inertia of the flywheel.

7. A multi-disc clutch consisting of 5 steel plates and 4 bronze plates. The inner and outer diameters of the friction lining are 70 mm and 140 mm respectively. The coefficient of friction is 0.1 and maximum intensity of pressure is 0.25 N/mm^2. Assuming uniform wear theory, determine

   i. The operating force required

   ii. The power transmitting capacity of the drive at 760 *rpm*.