Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech.(AE/ME) / (IE) (2008-09 Batch) (Sem.–3)

THEORY OF MACHINES-I

Subject Code : ME-203

Paper ID : [A0802]

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

l. Write briefly :

(a) Define a mechanism.

(b) How many turning pairs are there in a single slider crank chain ?

(c) Name two inversions of double slider crank chain.

(d) Explain pantograph.

(e) Explain initial tension in belts.

(f) What do you mean by a cam ?

(g) What is a dynamometer ?

(h) Define turning moment diagram.

(i) What is power and effort of governor ?

(j) Explain how the direction of coriolis acceleration (f^{cc}) changes with the changes in the direction of v and w as $f^{cc} = 2vw$.

SECTION-B

2. The driven shaft has a M.I. 30.4 Kg-m^2 and is inclined at 30° to the axis of the driving shaft. If the driving shaft at 2400 rpm, and driven shaft with a steady torque of 272 N-m, determine the maximum fluctuation of the output torque.

3. A V-belt of 6.0 cm^2 cross section has a groove angle of 40° and an angle of lap of 150°, $\mu = 0.10$. The mass of the belt per unit run is 1.2 Kg. The maximum allowable stress in the belt is 850 N/cm^2. Calculate the power that can be transmitted at a belt speed of 30 m/sec.

4. A multiplate disc clutch transmits 55 kW at 1800 rpm. Coefficient of friction for the friction surfaces is 0.1. Axial intensity of pressure is not to exceed 160 kN/m^2. The internal radius is 80 mm and is 0.70 times the external radius. Find the number of plates needed to transmit the required torque.

5. Determine the axial force required to engage a cone clutch transmitting 25 kW of power at 750 r.p.m. Average friction diameter of the cone is 400 mm, semi cone angle 10° and coefficient of friction 0.25.

6. A machine punching 3.8 cm diameter holes in a 3.2 cm thick plate, does 600 N-m of work per square cm of sheared area. The punch has a stroke of 10.2 cm and punches 6 holes per minute. The maximum speed of the flywheel at its radius of gyration is 27.5 m/sec. Find the mass of the flywheel so that its speed at the same radius does not fall below 24.5 m/sec. Also determine the power of the motor driving this machine.

SECTION-C

7. Explain uniform acceleration and retardation of the follower in terms of displacement, velocity, acceleration and jerks.

8. (a) Prove that Coriolis acceleration is given by $f^{cc} = 2vw$ where symbols have their usual meanings.

   (b) What is the difference between Davis and Ackerman steering mechanisms ?

9. A spring controlled governor with auxiliary spring (Wilson-Hartnell) has the mass of each ball as 2 Kg. Minimum radius is 10 cm and the maximum radius is 15 cm. The minimum speed is 250 rpm and maximum speed can be about 5% greater than the minimum. The combined stiffness of the two ball spring is 0.6 N/cm. Find the equivalent stiffness of the auxiliary spring. Assume vertical length of ball a = 12 cm and horizontal length from sleeve roller b = 10 cm.