Roll No. | | | | | | | | | | | | | **Total No. of Pages : 03**

Total No. of Questions : 09

B.Tech.(ME) (2011 Onwards)

B.Tech.(Marine Engineering) (2013 Onwards)

(Sem.–3)

THEORY OF MACHINES–I

Subject Code : BTME-302

Paper ID : [A1139]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTION 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 is the difference between simple and compound mechanism?

b) Show various possible directions of Coriolis acceleration.

c) Write the applications of cone' clutch.

d) Name the clutch which is used in cars and trucks.

e) Explain the working of steering mechanism.

f) Explain crowning of pulleys.

g) Why cycloidal motion of follower is preferred for high speed engines?

h) Why most of the mass of flywheel is conserved in its rims only?

i) Is it possible that to give the same equilibrium speed as in case of porter governor. balls of smaller mass will be required in proell governor?

j) Why uniform wear theory is used for the design of clutch?

SECTION–B

2. **Fig. 1** shows a slider crank chain.

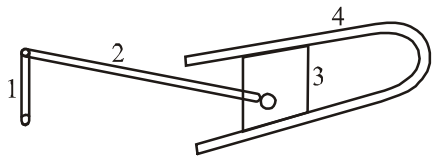

Fig.1

Link 1 = Crank

Link 2 = Connecting Rod

Link 3 = Slider

Link 4 = Cylinder Block

If link 1 of the above chain is fixed, which mechanism can be obtained?

3. The crank length of a petrol engine is 50 mm and the connecting rod is 175 mm long and the crank rotates at a uniform speed of 400 *r.p.m.* Calculate the velocity and acceleration of the piston at different positions of the piston along its stroke and plot the curves. Also find the crank position at which the piston's acceleration is zero.

4. The driven shaft has a moment of inertia 30·4 kg-m^2 and is inclined at 30º to the axis of the driving shaft. If the driving shaft rotates at 2400 *r.p.m.* and the driven shaft with a steady torque of 272 N-m, determine the maximum fluctuation of the output torque.

5. A belt drive has the following data :

Initial tension = 1500 N, Belt speed = 25 m/sec

Coefficient of friction = 0.2, Angle of contact = 165º

What increase in power can be obtained if a gravity idler is introduced which maintains the tensions on the slack side at the same value of initial tension and make the angle of contact on the smaller pulley as 195º.

6. An offset translating roller follower is driven by a cycloidal motion cam rotating at 600 *r.p.m.* The maximum follower rise is 3 cm during 150° of cam rotation. If the amount of offset is 0.5 cm, the pressure angle 14° for the offset follower at a cam angle of 60°, find the prime circle radius.

SECTION–C

7. A bicycle and rider of mass 90 kg are travelling at the rate of 15 km/hr on the level road. A brake is applied to the rear wheel which is 0.70 m in diameter and this is the only resistance acting. How far will the bicycle travel and how many turns will its wheel make before it comes to rest? The pressure applied on the brake is 100 N and $\mu = 0.06$.

8. In a Hartnell governor, the radius of ball is 60 mm at the minimum speed of 300 *r.p.m.* The length of the ball arm is 140 mm and the sleeve arm is 90 mm. The mass of each ball is 5 kg and the sleeve is 8 kg. The stiffness of spring is 32715 N/m. Determine :

   (i) Speed when the sleeve is lifted by 50 mm

   (ii) Initial compression of the spring

   (iii) Governor effort

   (iv) Power.

9. A punching machine having a stroke of 10 cm, punches a 1.25 cm hole once every 10 second in a 1 cm steel plate. During the punching operation it does 600 N-m of work per square cm of sheared area. The maximum linear speed of the flywheel rim is not to exceed 30 m/s. Design a suitable flywheel if this speed is not to fall below 27.5 m/s.