

**Roll No.**

**Total No. of Pages : 03**

**Total No. of Questions : 09**

**B.Tech.(ME) (Sem-3)**

# THEORY OF MACHINES-I

**Subject Code : BTME-302**

**M.Code : 59112**

**Date of Examination : 01-06-2023**

**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) Define link.
- b) What is higher pair? Give one example of higher pair.
- c) Write any two inversions of single slider crank chain.
- d) List main applications of Pantograph.
- e) What is crowning of pulley?
- f) Define creep in belts.
- g) What is radial cam?
- h) List different types of brakes.
- i) What is the function of flywheel?
- j) Define hunting of governor.

## SECTION-B

2. The crank of a slider crank mechanism rotates clockwise at a constant speed of 300 r.p.m. The crank is 150 mm and the connecting rod is 600 mm long. Determine : a) linear velocity and acceleration of the midpoint of the connecting rod, and b) Angular velocity and angular acceleration of the connecting rod, at a crank angle of  $45^\circ$  from inner dead centre position.
3. Explain Davis steering gear mechanism with a neat sketch.
4. A shaft rotating at 200 r.p.m. drives another shaft at 300 r.p.m. and transmits 6 kW through a belt. The belt is 100 mm wide and 10 mm thick. The distance between the shafts is 4m. The smaller pulley is 0.5 m in diameter. Calculate the stress in the belt, if it is an open belt drive. Taken  $\mu = 0.3$ .
5. A conical pivot supports a load of 20 kN, the cone angle is  $120^\circ$  and the intensity of normal pressure is not to exceed  $0.3 \text{ N/mm}^2$ . The external diameter is twice the internal diameter. Find the outer and inner radii of the bearing surface. If the shaft rotates at 200 r.p.m. and the coefficient of friction is 0.1, find the power absorbed in friction. Assume uniform pressure. <https://www.ptustudy.com>
6. The turning moment diagram for a petrol engine is drawn to the following scales: Turning moment, 1 mm = 5 N-m ; crank angle, 1 mm =  $1^\circ$ . The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270  $\text{mm}^2$ . The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m.

## SECTION-C

7. A cam rotating clockwise at a uniform speed of 100 r.p.m. is required to give motion to knife-edge follower as below :
  - a) Follower to move outwards through 25 mm during  $120^\circ$  of cam rotation,
  - b) Follower to dwell for the next  $60^\circ$  of cam rotation,
  - c) Follower to return to its starting position during next  $90^\circ$  of cam rotation, and
  - d) Follower to dwell for the rest of the cam rotation.

The minimum radius of the cam is 50 mm and the line of stroke of the follower passes through the axis of the cam shaft. If the displacement of the follower takes place with uniform and equal acceleration and retardation on both the outward and return strokes, find the maximum velocity and acceleration during outstroke and return stroke.

8. A Porter governor has all four arms 250 mm long. The upper arms are attached on the axis of rotation and the lower arms are attached to the sleeve at a distance of 30 mm from the axis. The mass of each ball is 5 kg and the sleeve has a mass of 50 kg. The extreme radii of rotation are 150 mm and 200 mm. Determine the range of speed of the governor.

9. **Write short note on :**

- a) Rope Brake Dynamometer
- b) Classification of Kinematic Pairs

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**