

B.Tech. 4th Semester (AUE) F-Scheme Examination,
May-2018

THEORY OF MACHINES

Paper-AUE-208-F

Time allowed : 3 hours] [Maximum marks : 100

Note : Attempt five questions in total at least one question from each section. Question No. 1 is compulsory. All questions carry equal marks.

1. Explain the following : 5×4=20
- (a) Turning-moment diagrams
 - (b) Law of gearing
 - (c) Path generation and function generation
 - (d) Gyroscopic effect on four-wheeled vehicles

Section-A

2. (a) Describe briefly the functions of elliptical trammel and scotch yoke. 10
- (b) Describe various inversions of slider-crank mechanism giving examples. 10
3. (a) What is Kutzbach's criterion for degree of freedom of plane mechanism ? In what way Gruebler's criterion is different from it ? 10

- (b) What are quick return mechanisms ? Where are they used ? Discuss the functioning of any one of them. 10

Section-B

4. (a) What is Instantaneous centre of rotation ? How do you know the number of instantaneous centres in a mechanism ? 10
- (b) Explain the procedure to construct Klein's construction to determine the velocity and acceleration of a slider-crank mechanism. 10
5. (a) State and prove the Kennedy's theorem as applicable to instantaneous centres of rotation of three bodies. How is it helpful in locating various instantaneous centres of a mechanism ? 10
- (b) Describe the procedure to draw velocity and acceleration diagrams of a four-link mechanism. In what way the angular accelerations of the output link and coupler are found ? 10

Section-C

6. Deduce expressions to find the linear velocity and acceleration and angular velocity and angular acceleration of the coupler of slider-crank mechanism.

7. What is Freudenstein's equation? How is it helpful in designing a four-link mechanism when three positions of the input ($\theta_1, \theta_2, \theta_3$) and the output link (ϕ_1, ϕ_2, ϕ_3) are known? 20

Section-D

8. A tangent cam with a base circle diameter of 50 mm operates a roller follower 20 mm in diameter. The line of stroke of the roller follower passes through the axis of the cam. The angle between the tangential faces of the cam is 60° , speed of the cam shaft 200 rpm and the lift of the follower 15 mm. Calculate, (i) the main dimensions of the cam. (ii) the acceleration of the follower at: (a) the beginning of lift, (b) where the roller just touches the nose, (c) the apex of the circular nose. 20
9. A pinion of 32 involute teeth and 4 mm module drives a rack. The pressure angle is 20° . The addendum of both pinion and rack is same. Determine the maximum permissible value of the addendum to avoid interference. Also, find the number of pairs of teeth in contact. 20