

CBCS SCHEME

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18SM34

Third Semester B.Tech. Degree Examination, Feb./Mar. 2022 Theory of Machines

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define the following terms :
i) Kinematic link
ii) Kinematic pair
iii) Kinematic chain
iv) Inversion
v) Mechanism. (10 Marks)
- b. Describe with neat sketch any two inversions of double slider-crank mechanism. (10 Marks)

OR

- 2 a. Describe with neat sketch of Whitworth mechanism and peaucelliers mechanism. (10 Marks)
- b. Explain neat sketch of Geneva wheel mechanism and pantograph. (10 Marks)

Module-2

- 3 a. Define the following :
i) Linear and angular velocity
ii) Linear and angular acceleration. (04 Marks)
- b. A four bar mechanism ABCD is pin jointed at ends and the link AD is fixed of length 600mm. The links AB, BC and CD are 300mm, 360mm and 360mm respectively. At certain instant the link AB makes an angle of 60° with link AD. If the link AB rotates at an angular velocity of 10 rad/sec and an angular acceleration of 30 rad/sec^2 both clockwise. Determine angular velocity and angular acceleration of links BC and CD by graphical methods. (16 Marks)

OR

- 4 a. What is instantaneous center of rotation of body? Discuss different type of instantaneous centers. (06 Marks)
- b. In slider crank mechanism crank $OA = 300\text{mm}$. connecting rod $AB = 120\text{mm}$ the crank OA is turned 30° from IDC. Locate all the instantaneous centers. IF the crank rotates at 15rad/sec clockwise. Find :
i) Velocity of slider
ii) Angular velocity of connecting rod AB. (14 Marks)

Module-3

- 5 Using complex Algebra derive expression for velocity, Angular velocity, acceleration and angular acceleration of coupler link and output link of a four bar mechanism. (20 Marks)

OR

- 6 a. Derive the Freudenstein's equation for four bar mechanism. (08 Marks)
 b. Determine the length of the links of four bar function $Y = 5 \sin X$ with input range of $0^\circ < \theta < 90^\circ$. Angle of the driving link from 30° to 150° and driven link from 60° to 130° . (12 Marks)

Module-4

- 7 The following data relate to a cam profile in which the follower moves with uniform acceleration and deceleration during ascent and descent. Minimum radius of the Cam = 25mm, Roller radius = 7.5mm, Life is 28mm, offset of follower axis is 12mm towards right, angle of ascent = 60° , angle of descent = 90° , angle of dwell between ascent and descent = 45° speed of cam 200rpm. Draw the profile of the cam. (20 Marks)

OR

- 8 A cam drives a flat reciprocating follower in the following manner. During first 120° relation of the cam, follower moves outwards through a distance of 20mm with simple harmonic motion. The follower dwells during next 30° of cam rotation. During next 120° of cam rotation, the follower moves inwards with simple harmonic motion. The follower dwells for the next 90° of cam rotation. The minimum radius of the cam is 25mm. Draw the profile of the cam. (20 Marks)

Module-5

- 9 a. Derive an expression for path of contact for two meshing spur gears having involutes profile. (08 Marks)
 b. Two gear wheel mesh externally and are to give a velocity ratio of 3. The teeth are of involute form of module 6mm and standard addendum one module. Pressure angle = 18° , Pinion rotates at 90rpm. Find :
 i) Number of teeth on each wheel so that interference is just avoided
 ii) Length of path of contact
 iii) Length of arc of contact
 iv) Number of pairs of teeth in contact. (12 Marks)

OR

- 10 a. Briefly explain the types of Geartrain with sketch. (06 Marks)
 b. The arm of an epicyclical gear train rotates at 100 rpm in the anticlockwise direction. The arm carries two wheels A and B having 36 and 45 teeth respectively. The wheel A is fixed and the arm rotates about the centre of wheel A find the speed of the wheel B. What will be the speed of B, if the wheel A instead of being fixed, makes 200rpm. (14 Marks)

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