Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: ME301

Course Name: MECHANICS OF MACHINERY (ME, MP, PE)

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any three full questions, each carries 10 marks Marks

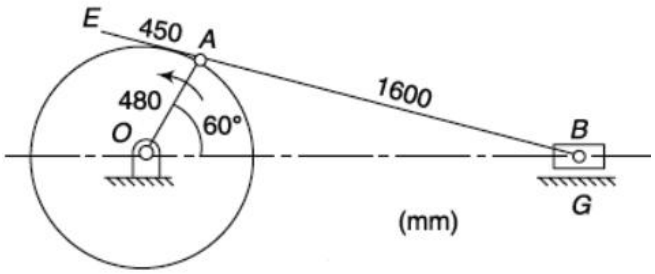
1 a) Define the following terms: (4)
i) Kinematic link ii) Kinematic pair iii) Kinematic chain iv) Mechanism

b) Classify kinematic pair with examples. (6)

2 a) State and prove Kennedy's theorem. (6)

b) A slider crank mechanism has lengths of the crank and the connecting rod equal to 200 mm and 200 mm respectively. Locate all the instantaneous centres of the mechanism for the position of the crank when it has turned through 30^o from the inner dead centre. Also find the velocity of the slider and the angular velocity of the connecting rod if the crank rotates at 40 rad/sec. (4)

3 For the configuration of a slider mechanism in the Figure shown below. Calculate: (10)
i) The acceleration of the slider at B ii) The acceleration of point E
iii) The angular acceleration of link AB. OA rotates at 20 rad/s counter-clockwise.



4 How are cams and followers classified? Describe in detail. (10)

PART B

Answer any three full questions, each carries 10 marks

5 Draw the profile of a cam that gives a lift of 25 mm to a rod carrying a 5 mm diameter roller. The axis of the roller passes through the centre of the cam. The least radius of the cam is 20 mm. The rod is to be lifted with cycloidal motion for 120^o of cam rotation and is followed by dwell period of 60^o. The follower is dropped suddenly at an angle of 90^o of cam rotation with SHM motion followed by dwell. Determine the maximum velocity and maximum acceleration during the outstroke and return stroke. The camis rotated at 1200 rpm clockwise direction. (10)

6 In a symmetrical tangent cam operating a roller follower, the least radius of the cam is 30 mm and roller radius is 17.5 mm. The angle of ascent is 75^o, lift is 17.5 mm and the speed of the cam is 600 rpm. Calculate: (10)

i) Principal dimensions of the cam.
ii)The acceleration of the follower at the beginning of the lift, where straight flank merges into the circular nose and at the apex of the circular nose. Assume that, there is no dwell between ascent and descent.

7 Two 20^o gears have a module pitch of 5mm. The number of teeth on the pinion is 20 and the gear ratio is 2. If the pitch line speed is 1.2 m/s, assuming addendum as standard and equal to one module. Find: (10)
i) The angle turned through by pinion when one pair of teeth is in mesh and
ii) The maximum velocity of sliding

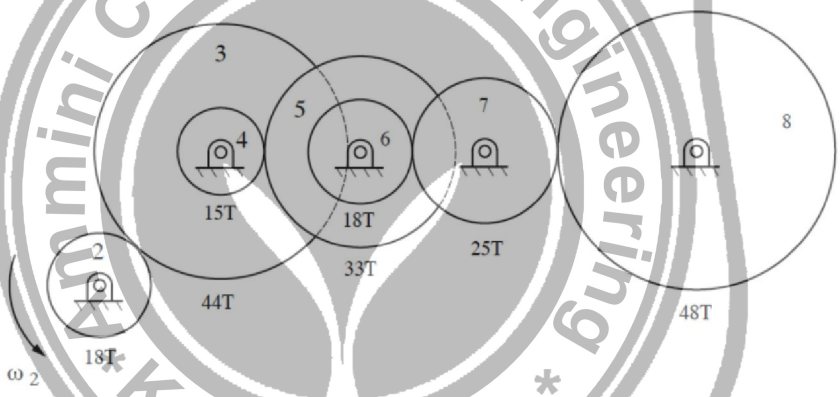
8 What is meant by interference and undercutting in involute gears? What are the methods to avoid interference of gears? (10)

PART C

Answer any four full questions, each carries 10 marks

9 a) What is a gear train? Explain the different types of gear trains. (8)

b) Find the angular velocity of gear 8 if the angular velocity of gear 2 is 800 rpm in the direction shown below: (2)



10 In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 rpm in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed, makes 300 rpm in the clockwise direction, what will be the speed of gear B? (10)

11 a) Explain the different tasks in kinematic synthesis problems. (4)

b) Explain the different types of synthesis. (6)

12 a) Explain what do you mean by structural error? (4)

b) Explain the two-position synthesis of a slider crank mechanism. (6)

13 Derive Freudenstein's equation for kinematic synthesis (10)

14 Synthesize a function generator to solve the equation $y=1/x$ over the range $1 \leq x \leq 2$ using three precision positions. Assume 30^0 starting and 120^0 for the finishing position for the input link and 240^0 starting and 330^0 finishing for the output link. (10)

****