

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SECOND SEMESTER MTECH DEGREE EXAMINATION, MAY 2016

Mechanical Engineering
(Machine Design)

01ME6102 Advanced Theory of Mechanisms

Max. Marks : 60

Duration : 3 Hours

Answer any TWO questions from each part

PART A

(Modules I & II)

1) A petrol engine has a stroke of 12.5 cm with a connecting rod 25 cm length. It runs at 2000 rpm.
The crank shaft is offset 1.9 cm from cylinder centre line. Find the velocity and acceleration of the Piston when at one quarter of the stroke from the crank end on both the strokes.

2) Write short notes on following.

i) Complex Mechanisms

ii) Collineation axis

iii) Radius of curvature.

3) Find the inflection circle for the motion of coupler of a slider crank chain having following Specifications.

Radius of crank = 5 cm

Length of connecting rod = 7.5 cm

Crank makes an angle of 30 degree with line of stroke. Also find instantaneous radius of curvature of path of a coupler point located 2.5 cm from crank pin.

(9 x 2 = 18 marks)

PART B

(Modules II & IV)

4a) State the significance and derive four bar mechanism coupler curve equation.

(6 marks)

b) What do you mean by asymptotes of coupler curve?

(3marks)

5a) state and prove Roberts law of cognate linkages

(6 marks)

b) Show that any coupler curve of a four bar mechanism can be traced by a five bar mechanism.

(3 marks)

6) A dwell-rise-dwell cam has a rise of 2.5 cm with a cycloidal motion in 150 degree of cam motion.

The follower is assembled with a 400 N/cm retaining spring which has sufficient preload to prevent jumping. The follower train has an equivalent mass of 250 gm and an equivalent stiffness of 7000 N/cm. Find the follower response for a cam speed of 3500 rpm by the phase plane method.

(9 x 2 = 18 marks)

PART C

(Modules V & VI)

7) A four mechanism is required such that the input and output angles are coordinated as given below. Synthesize the four mechanism

Input crank angle (degree)	30	50	80	
Output follower angle (degree)	0	30	60	12 marks

8a) Derive expressions for the relation between the moments and products of inertia of a body with respect to one system of co-ordinate axes and those with respect to another system of co-ordinate axes attained by a rotation of the axes.

(6 marks)

b) Explain how kinetic energy of a rigid body in three dimensions can be evaluated ?

(6 marks)

9a) State and derive all necessary conditions of a four wheel vehicle moving on a curved path.

(6 marks)

b) Discuss the factors affecting motion of rigid body about a fixed axis.

(6 marks)

(12 x 2 = 24 marks)
