Code No: R22032 **R10** SET - 1

II B. Tech II Semester Supplementary Examinations, April/May-2017
KINEMATICS OF MACHINERY
(Com. to ME, AME, MM)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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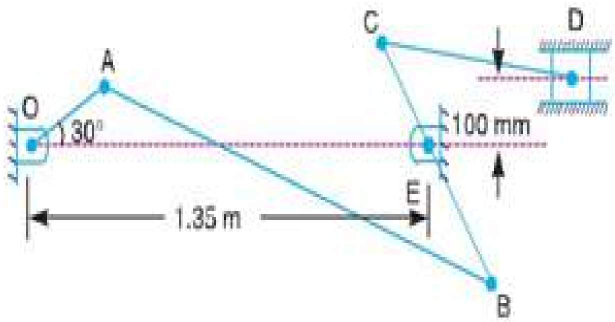
1. a) Sketch and describe the four bar chain mechanism. Why it is considered to be the basic chain? (7M)
   b) A crank and slotted lever mechanism used in a shaper has a centre distance of 300 mm between the centre of oscillation of the slotted lever and the centre of rotation of the crank. The radius of the crank is 120 mm. Find the ratio of the time of cutting to the time of return stroke. (8M)

2. a) Describe the Watt's parallel mechanism for straight line motion and derive the condition under which the straight line is traced. (7M)
   b) Discuss about Scott Russul straight line mechanism (8M)

3. A mechanism, as shown in Fig.1, has the following dimensions: (15M)
   OA = 200 mm; AB = 1.5 m; BC = 600 mm; CD = 500 mm and BE = 400 mm. Locate all the instantaneous centres. If crank OA rotates uniformly at 120 r.p.m. clockwise, find i) the velocity of B, C and D,
   ii) The angular velocity of the links AB, BC and CD.



4. a) The driving shaft of a Hooke's joint runs at a uniform speed of 240 r.p.m. and the angle α between the shafts is 20°. The driven shaft with attached masses has a mass of 55 kg at a radius of gyration of 150 mm. (9M)
   i) If a steady torque of 200 N-m resists rotation of the driven shaft, find the torque required at the driving shaft, when θ = 45°.
   ii) At what value of 'α 'will the total fluctuation of speed of the driven shaft be limited to 24 r.p.m ?
   b) Prove that in double Hooke's joint the speed of drive shaft and driven shaft runs at constant speed. (6M)
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5. A cam is to be designed for a knife edge follower with the following data : (15M)
i) Cam lift = 40 mm during 90° of cam rotation with simple harmonic motion.
ii) Dwell for the next 30°.
iii) During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion.
iv) Dwell during the remaining 180°. Draw the profile of the cam when
a) the line of stroke of the follower passes through the axis of the cam shaft, and
b) the line of stroke is offset 20 mm from the axis of the cam shaft.
The radius of the base circle of the cam is 40 mm. Determine the maximum velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 240 r.p.m.

6. a) Prove that the velocity of sliding is proportional to the distance of the point of contact from the pitch point. (7M)
b) Determine the minimum number of teeth required on a pinion, in order to avoid interference which is to gear with, i) a wheel to give a gear ratio of 3 to 1 ; and ii) an equal wheel. The pressure angle is 20° and a standard addendum of 1 module for the wheel may be assumed. (8M)

7. a) What is centrifugal tension in a belt? How does it affect the power transmission (7M)
b) Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN, and the coefficient of friction between the belt and pulley is 0.25? (8M)

8. An epicyclic gear train consists of a sun wheel S, a stationary internal gear E and three identical planet wheels P carried on a star- shaped planet carrier C. The size of different toothed wheels is such that the planet carrier C rotates at 1/5th of the speed of the sun wheel S. The minimum number of teeth on any wheel is 16. The driving torque on the sun wheel is 100 N-m. Determine: i) number of teeth on different wheels of the train, and ii) torque necessary to keep the internal gear stationary. (15M)