CBCS SCHEME

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17AU43

Fourth Semester B.E. Degree Examination, Jan./Feb.2021
Kinematics 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 with suitable examples:
(i) Higher pair.
(ii) Kinematic pair.
(iii) Mechanism. **(06 Marks)**

b. Explain with the help of neat sketches:
(i) Four bar mechanism.
(ii) Parallel crank mechanism.
(iii) Elliptical Tranmel. **(14 Marks)**

OR

2 a. With neat diagram, explain "ACKERMANN" stearing mechanism and "TOGGLE" mechanism. **(12 Marks)**

b. With neat diagram, explain Geneva mechanism and Ratchet and Pawl mechanism. **(08 Marks)**

Module-2

3 In a slider crank mechanism, the Crank OB = 30 mm, connecting rod BC = 120 mm, the crank rotates at a uniform speed of 300 rpm clockwise. For the crank position shown in Fig. Q3, determine velocity of piston 'C' and angular velocity of connecting rod 'BC', acceleration of piston 'C' and angular acceleration of connecting rod 'BC'. **(20 Marks)**

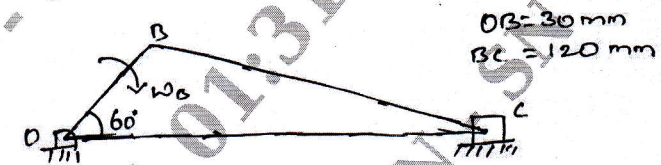

Fig. Q3

OR

4 A pin jointed four bar mechanism 'ABCD' is shown in Fig. Q4. AB = 150 mm, BC = 180 mm, CD = 180 mm and AD = 300 mm. Link AB rotates uniformly at 100 rpm. Locate all the instantaneous centers and find the angular velocity of Link BC and Linear velocity of Link CD. **(20 Marks)**

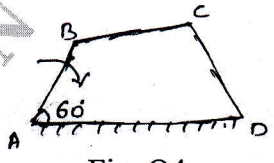

Fig. Q4

Module-3

5 If the crank and connecting rod are 150 mm and 600 mm long respectively and crank rotates at a uniform speed of 100 rpm clockwise. Determine (i) Angular velocity and Angular acceleration of connecting rod. (ii) Velocity and acceleration of piston. The angle which the crank makes with IDC is 30°. **(20 Marks)**

OR

6 Determine the velocity and acceleration of piston by KLEIN's construction to the following specifications:
Stroke = 300 mm; Ratio of connecting rod to Crank length = 4, Speed of Engine = 300 rpm, Position of crank = 45° with I.D.C. **(20 Marks)**

Module-4

7 a. Derive the expression for length of arc of contract in a pair of spur gears in mesh. **(08 Marks)**

b. A pair of gears 40 and 30 teeth respectively are of 25° involute form. Addendum = 5 mm, Module = 2.5 mm. If the smaller wheel is the driver and rotate at 1500 rpm, find the velocity of sliding at point of engagement, at pitch point and at the point of dis-engagement, length of path of contact and length of arc of contact. **(12 Marks)**

OR

8 In an Epicyclic gear train, the internal wheels A, B and compound wheel C and D rotate independently about axis '0'. The wheels E and F rotate on a pin fixed to arm 'G'. 'E' gears with A & C, F gears with B & D. All the wheels have same pitch and number of teeth on E and F are 18, C = 28, D = 26.

(i) Sketch the arrangement
(ii) Find number of Teeth on A & B
(iii) If arm 'G' makes 150 rpm CW and 'A' is fixed, find speed of 'B' .
(iv) If the arm 'G' makes 150 rpm (CW) and wheel A makes 15 rpm (CCW), find speed of 'B'. **(20 Marks)**

Module-5

9 Draw to full size the profile of a cam which will give a lift of 38 mm to a follower carrying a roller of 25 mm diameter. The axis of the follower is off set by 18 mm to the right of axis of cam. Ascent of the follower takes place with S.H.M in 0.05 second followed by period of rest 0.0125 second. The follower by then descent with UARM during 0.125 second, the acceleration being 3/5 times retardation. The cam rotates in clockwise direction at a constant speed of 240 rpm and base circle radius is 50 mm. **(20 Marks)**

OR

10 Draw the profile of disc cam with roller follower to give a rise of 63 mm during 3/8 revolution of cam and dwell in the lifted position for 1/8 revolution and a sudden drop of follower through 33 mm and followed by a dwell of $\frac{1}{8}$ revolution and further fall to lowest position during $\frac{1}{4}$ revolution and remain at rest for the rest of revolution of cam.

The raise of the follower takes place through cycloidal motion and the fall will take place through SHM. Least radius of cam is 40 mm and roller diameter is 20 mm. The line of stroke of follower is in line of axis of cam. Assume the cam shaft to rotate clockwise uniformly. **(20 Marks)**

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