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10ME/AU44

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019

Kinematics of Machines

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. What is inversion? Explain its importance. **(04 Marks)**

b. Differentiate between machine and mechanisms. **(04 Marks)**

c. Describe with neat sketches two inversions of double slider crank chain. **(12 Marks)**

2 a. Explain the whitworth quick return motion mechanism with a sketch. **(08 Marks)**

b. Explain the following with sketches and state its applications:
i) Pantograph
ii) Geneva wheel
iii) Robert mechanism **(12 Marks)**

3 A double slider crank mechanism is shown in Fig.Q3. The crank OA rotates at a constant angular velocity of 10 rad/sec. The links OA, AB and AC are 100 mm, 200 mm and 200 mm long respectively. By drawing the acceleration and velocity polygon, determine:
i) Velocity and acceleration of each slider.
ii) Angular velocity and angular acceleration of each connecting rod.

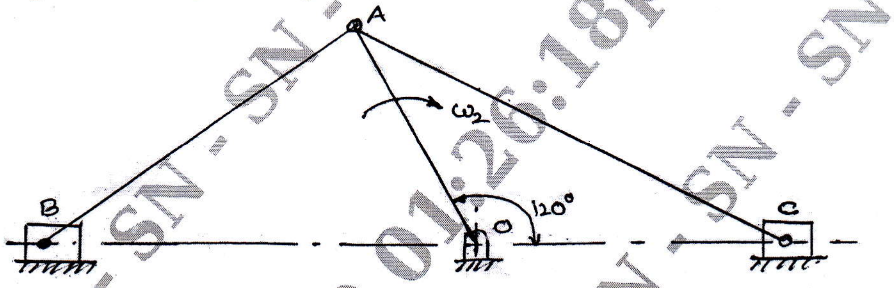

Fig.Q3 **(20 Marks)**

4 a. In a four bar mechanism, the crank AB is 300 mm long, BC = CD = 360 mm and AD the fixed link is 600 mm long. The crank makes an angle of 60° with fixed link and it rotates uniformly at 100 rpm. Locate all the instantaneous centres and find the angular velocity of link BC. **(10 Marks)**

b. Determine the velocity and acceleration of the piston by Klien's constructions to the following specification:
Stroke = 300 mm
Ratio of length of connecting rod to crank length = 4
Speed of the engine = 300 rpm
Position of the crank = 45° with IDC **(10 Marks)**

PART – B

5 If the crank an connecting rod are 150 mm and 600 mm long respectively and the crank rotates at uniform speed of 100 rpm clockwise, determine by using analytical expressions the (i) angular velocity and angular acceleration of connecting rod (ii) velocity and acceleration of the piston. The angle when the crank makes with IDC is 30°. **(20 Marks)**

6 a. State and explain 'law of gearing'. **(06 Marks)**

b. Compare cycloidal and involute gear tooth forms. **(04 Marks)**

c. Two spur gear wheels have 23 and 57 teeth. The profile of the gear is involute with a pressure angle of 20° and the module 8 mm and the addendum of gears is 1 module. Calculate:

i) Length of path of contact
ii) Length of Arc of contact
iii) Number of pairs of teeth in contact **(10 Marks)**

7 An epicyclic gear train of sun and planet type is shown in Fig.Q7. The pitch diameter of internally toothed ring D is approximately 228 mm and the module is 4 mm. When the ring is stationary the spider A which carries three planet wheels C of equal size is to make one revolution for every five revolution of the spindle carrying the sun wheel B. Determine the suitable number of teeth for all the wheel and the exact pitch circle of ring D. If a torque of 30 N-m is applied to the sun wheel B. What is the torque required to keep the ring stationary?

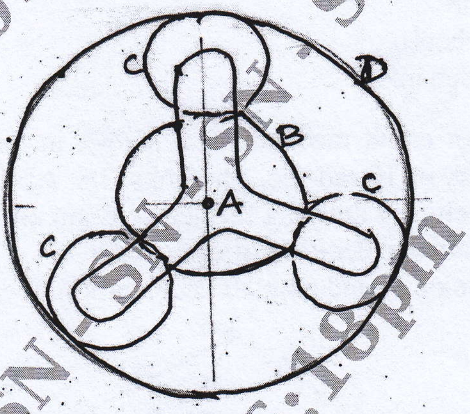

Fig.Q7

(20 Marks)

8 Draw the profile of cam operating a reciprocating follower carrying a roller of diameter 15 mm. The minimum radius of cam is 25 mm. Lift = 30 mm. the cam lifts the follower for 120° of cam rotation with SHM, followed by a dwell period of 30°, then the follower returns to starting position through 150° of cam rotation with UARM and then dwells for the rest of the period of cam rotation. The cam rotates at a uniform speed of 150 rpm (clockwise). The axis of the follower passes through the axis of cam shaft. **(20 Marks)**

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