CBCS Scheme

USN | | | | | | | | | | 15AU43

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Kinematics of Machine

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define following :
i) Link
ii) Kinematic pair
iii) Structure
iv) Degree of freedom. **(04 Marks)**

b. Calculate mobility of mechanism as shown in Fig.Q1(b). **(03 Marks)**

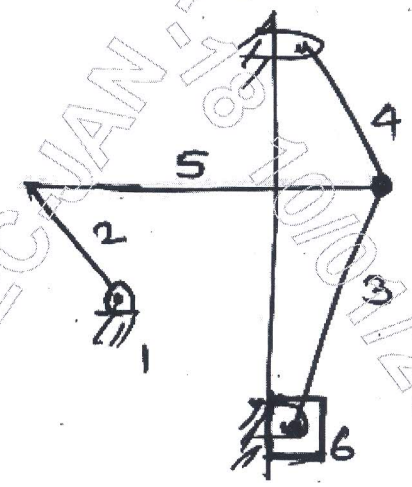

Fig.Q1(b)

c. Explain with neat sketch construction and working of crank and slotted lever quick return mechanism. **(09 Marks)**

OR

2 a. Draw and explain construction and working of Peaucellier's straight line mechanism. **(04 Marks)**

b. Write short note on the following mechanism with neat sketch :
i) Geneva wheel
ii) Ratchet and Pawl mechanism
iii) Pantograph. **(12 Marks)**

Module-2

3 a. State and prove Kennedy's theorem of instantenous centers. **(04 Marks)**

b. The mechanism shown in Fig.Q3(b) has following dimensions OA = 100mm, AB = 280mm, BC = 240mm and CD = 120mm. The centre of gravity of link AB is located at a distance of 120mm from A. Determine the velocity of G, D and angular velocity of link AB and the bell crank lever BCD. The crank OA rotates uniformly at 30 rad/sec. Use instantenous centre method. **(12 Marks)**

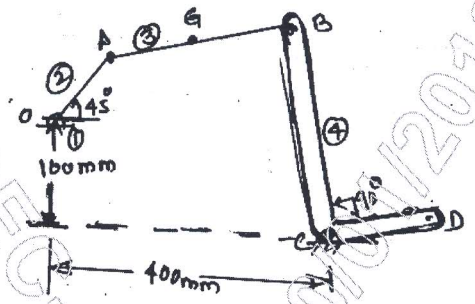

Fig.Q3(b)

OR

4 For four bar mechanism as shown in Fig.Q4, determine the acceleration of C and angular acceleration of link 3, when crank 2 rotates at 20 rad/sec. O_2O_4 = 200mm, O_2A = 150mm, AB = 450 mm, O_4B = 300mm and O_4C = 200mm. **(16 Marks)**

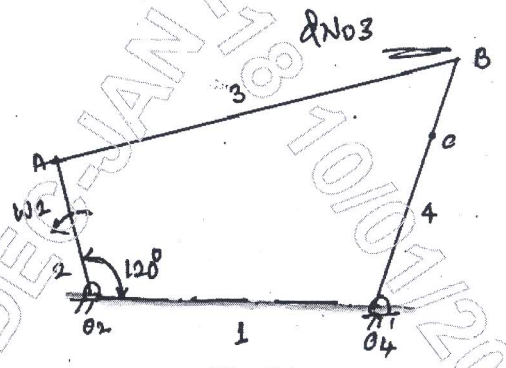

Fig.Q4

Module-3

5 In a four bar mechanism ABCD (Fig.Q5) link AB = 300mm, BC = 360mm, CD = 360mm, and fixed link AD = 600mm. The link AB makes 60° with fixed link AD. The link AB has an angular velocity of 10 rad/sec and angular acceleration 30 rad/sec^2 both clockwise. Determine the angular velocity and angular acceleration of link BC and CD. **(16 Marks)**

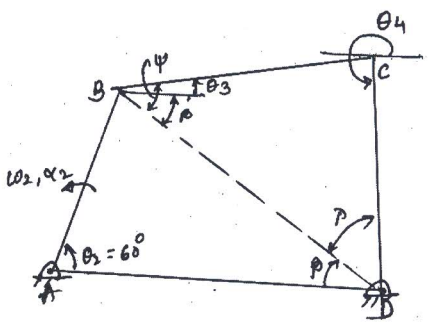

Fig.Q5

OR

6 a. The crank of an engine is 200mm long and ratio of length of connecting rod to crank radius is 4. Determine acceleration of piston when crank turns through 45°from inner dead centre position and moving towards centre at 240 rpm by complex algebra method. **(08 Marks)**

b. The crank and connecting rod of reciprocating engine are 200mm and 700mm respectively. the crank is rotating in clockwise direction at 120rad/sec. Using Klein's construction find : i) Velocity and acceleration of piston ii) Velocity and acceleration of the midpoint of the connecting rod iii) Angular velocity and angular acceleration of connecting rod at instant when crank is at 30° from inner dead centre. **(08 Marks)**

Module-4

7 a. Sate and prove law of gearing. **(05 Marks)**

b. A pair of 20° full depth involute spur gear having 30 and 50 teeth of module 4mm are in mesh. The smaller gear rotates at 1000rpm. Determine : i) sliding velocities at engagement and disengagement of pair of teeth ii) contact ratio. **(11 Marks)**

OR

8 a. Explain different types of gear trains with neat sketches. **(08 Marks)**

b. An epicyclic gear train consists of a sun wheel S, a stationery internal gear E and three identical planet gears P carried on a carrier C. The size of different toothed wheels are such that planet carrier C rotates at $\frac{1^{th}}{5}$ speed of sun wheel S. Minimum number of teeth on any sun wheel is 16. The driving torque on sun wheel is 100N–m. Determine :

i) Number of teeth on different wheels of gear train

ii) Torque necessary to keep the internal gear stationery. **(08 Marks)**

Module-5

9 a. Define following with respect to cams :

i) Prime circle ii) Pressure angle iii) Pitch point iv) Trace point. **(04 Marks)**

b. A cam rotating clockwise at uniform speed of 300 rpm operates a reciprocating follower having roller of 10mm diameter. The following motions defined below :

i) Moves outward during 120° of cam rotation with UARM

ii) Dwell in lifted position for next 30° of cam rotation

iii) returns with SHM for next 120° of cam rotation stroke of the follower is 30mm. The minimum radius of cam is 20mm. Draw profile of cam when line stroke of follower passes through centre of cam shaft. Also calculate maximum velocity and acceleration of follower during out stroke. **(12 Marks)**

OR

10 Draw a cam profile the drive oscillating follower as per following specifications :

i) Flower to move outward through angular displacement of 20° during first 120° of cam rotation

ii) Follower to return to its initial position during next 120° of cam rotation

The distance between follower pivot centre and roller centre is 120 mm; distance between pivot centre and roller axis is 130mm; minimum radius of cam is 40mm; radius of roller is 10mm. Inward and outward strokes takes place with SHM. **(16 Marks)**

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