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10ME/AU44

Fourth Semester B.E. Degree Examination, June/July 2018
Kinematics of Machines

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define the following with an example each:
(i) Flexible link. (ii) Higher pair. (iii) Spherical pair.
(iv) Successfully constrained motion. (v) Unclosed pair. **(05 Marks)**

b. Determine the mobility of the system shown in Fig. Q2 (b). **(05 Marks)**

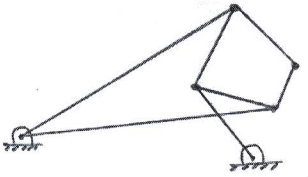

Fig. Q2 (b)

c. With neat sketch, explain (i) Oldham's coupling. (ii) Rotary engine. **(10 Marks)**

2 With neat sketch, explain (i) Quick return motion mechanism. (ii) Straight line mechanism (exact). (iii) Intermittent motion mechanism. **(20 Marks)**

3 In the mechanism shown in Fig. Q3 line OA = 320 mm, AC = 680 mm and OQ = 650 mm. Determine (i) the angular velocity of the cylinder. (ii) the sliding velocity of the plunger. (iii) the absolute velocity of the plunger. when the crank QA rotates at 20 rad/sec CW. **(20 Marks)**

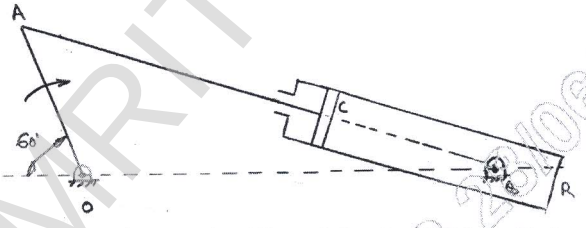

Fig. Q3

4 In the toggle mechanism shown in Fig. Q4, the slider D is constrained to move in a horizontal path. The crank OA is rotating in CCW direction at a speed of 180 rpm. The dimensions of the various links are as follows: OA=180 mm, CB=240 mm, AB=360 mm, BD=540 mm. Find:(i) Velocity of slider. (ii) Angular velocity of links AB, CB, BD using instantaneous centre method. **(20 Marks)**

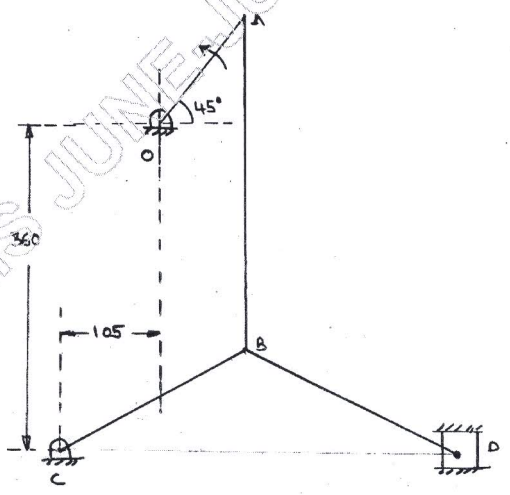

Fig. Q4

PART – B

5 In the 4-bar mechanism shown in Fig. Q5, link AB rotates uniformly at 2 rad/sec in CW sense. Using complex algebra write loop closure equation for this. Determine magnitude and directions of angular velocity and angular acceleration of links BC and CD using vector algebra. Also, state whether the magnitudes of angular velocity of these links tend to increase or decrease at the instant. **(20 Marks)**

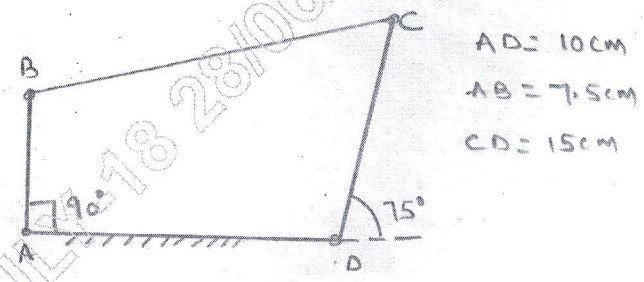

Fig. Q5

6 a. Compare involute and cycloidal tooth profile of a gear with respect to, (i) Pressure angle (ii) Interface. **(04 Marks)**

b. A standard full depth $14\frac{1}{2}^{\circ}$ gear have a module of 5 mm, pinion has 15 teeth while the wheel has 60 teeth knowing the addendum = 1 module,

(i) Show that the gear will interfere with the pinion.

(ii) What should be the pressure angle to avoid interference, if all other details remain same? **(16 Marks)**

7 Two shafts A and B are co-axial. A gear C (50 teeth) is rigidly mounted on shaft 'A'. A compound gear D-E gears with 'C' and an internal gear 'G', D has 20 teeth and gears with 'C' and 'E' has 35 teeth and gears with an internal gear 'G'. Gear 'G' is fixed and is concentric with the shaft axis. The compound gear D.E is mounted on a pin which projects from an arm keyed to the shaft 'B'.

(i) Sketch the arrangement.

(ii) Find the number of teeth on the internal gear G assuming that all gears have the same module.

(iii) If the shaft A rotates at 110 rpm, find the speed of shaft B. **(20 Marks)**

8 For a cam follower system shown in Fig. Q8, draw the displacement diagram for the follower and cam profile. Motion of the follower is as follows. Rise through 20° in 90° cam rotation in SHM, dwell in 90° cam rotation, fall in 90° cam rotation in SHM. The cam rotates in CW direction. **(20 Marks)**

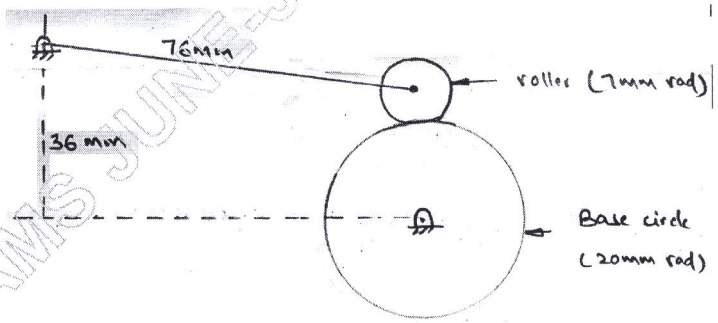

Fig. Q8

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