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10ME/AU44

Fourth Semester B.E. Degree Examination, Dec.2014/Jan.2015
Kinematics of Machines

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What do you mean by rigid link? Explain types of links with examples. **(06 Marks)**

b. Explain the following inversions with neat sketch:
   i) Double rocker mechanism.
   ii) Crank and slotted lever type quick return motion mechanism. **(10 Marks)**

c. Define degrees of freedom and state the relation for the same for planar mechanisms having only turning and sliding pairs. **(04 Marks)**

2 a. Sketch Peausellies mechanism and prove that it can trace a straight line. **(10 Marks)**

b. Explain pawl and ratchet wheel mechanism with neat sketch. **(05 Marks)**

c. With neat sketch, explain the conditions for correct steering for Ackermann-mechanism. **(05 Marks)**

3 a. What is Coriolis component of acceleration? Derive the expression for the same. **(08 Marks)**

b. A quick return motion mechanism is shown in Fig.Q.3(b). Link 2 rotates with constant speed of 21 rad/sec. in CW direction. Determine the angular acceleration of link 3. Take OA = 150mm, OC = 350mm, CB = 250mm. **(12 Marks)**

4 a. State and prove Kennedy's theorem. **(05 Marks)**

b. Locate all I-centers for the mechanism shown in Fig.Q.4(b). Find the velocity of the slider by I-center method W_2 = 20 r/s CCW. Take OA = 180mm, AB = 360mm, BC = 250mm and BD = 540mm. **(15 Marks)**

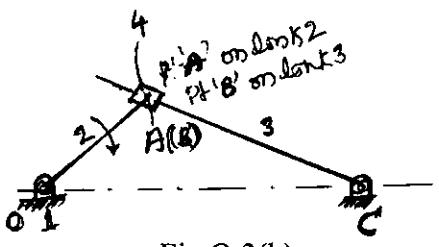

Fig.Q.3(b)

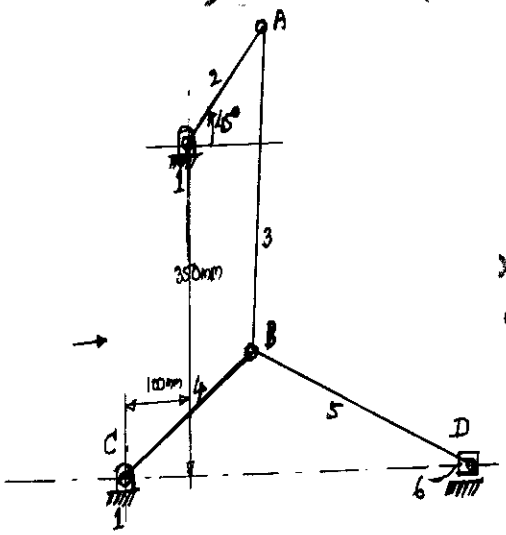

Fig.Q.4(b)

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 – B

5 a. Using complex algebra derive the expressions for velocity and acceleration of the piston for an in-line slider crank mechanism. **(10 Marks)**

b. For an in-line slider crank mechanism of crank length of 50mm, crank angle of 30° and connecting rod of length of 150mm. Determine the velocity and acceleration of the slider using complex algebra-method. Take the constant speed of crank as 2100rpm in CW direction. **(10 Marks)**

6 a. What is interference? Derive the relation for the minimum number of teeth for a pair of involute profile of teeth to avoid interference. **(10 Marks)**

b. The two spur gears of 19 and 47 teeth respectively are in mesh. The module is 6.5mm and pressure angle is 20°. Determine the number of pairs in contact and the angle turned by the larger wheel when one pair of teeth in contact. **(10 Marks)**

7 a. Explain reverted type gear train with sketch. **(05 Marks)**

b. An epicyclic gear train is shown in Fig.Q.7(b) Annular gear A is keyed to the driving shaft and has 30 teeth. Compound wheel C and D of 20 and 22 teeth respectively are free to rotate on the pin fixed to the arm P which is rigidly connected to the driven shaft. Internal gear B which has 32 teeth is fixed. If the driving shaft runs at 100rpm in CW. Find the speed of the driven shaft. What is the direction of rotation of the driven shaft with reference to the driving shaft? **(15 Marks)**

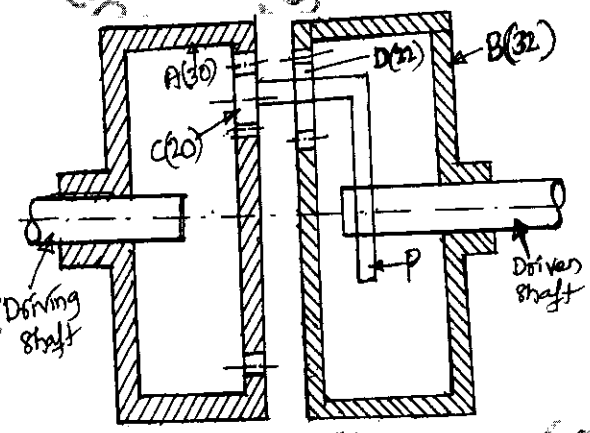

Fig.Q.7(b)

8 Draw the cam profile for the following data for a roller follower:

Offset	= 10mm towards right of cam center
Roller radius	= 10mm
Minimum radius of the cam	= 20mm
Maximum displacement of the follower	= 24mm
Outstroke angle	= 90° of cam rotation with UARM, acceleration being half of the retardation
Dwell at the elevated position	= 30° of cam rotation
Return stroke	= 90° of cam rotation with modified uniform velocity

After the return stroke cam dwells for the remaining period. Determine the maximum velocity and acceleration during outstroke only. Speed of cam is 600rpm in CW. **(20 Marks)**

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