Total No. of Questions – [08]

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G.R. No.	

Paper code : U228-151 (RE-FS)

MAY 2019/ENDSEM RE-EXAM

S. Y. B. TECH. (Mechanical Engineering) (SEMESTER - II)

COURSE NAME: Kinematics of Machinery

COURSE CODE: MEUA22171

(PATTERN 2017)

Time: [**2 Hours**]

[Max. Marks: **50**]

(*) Instructions to candidates:

1) **Answer Q.1, Q.2, Q.3, Q.4, Q.5 OR Q.6, Q.7 OR Q.8**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data where ever required**

Q.1) a) Write a short note on inversions of four bar mechanism. [6]

OR

b) Determine DOF of following mechanism shown in figure 1 [6]

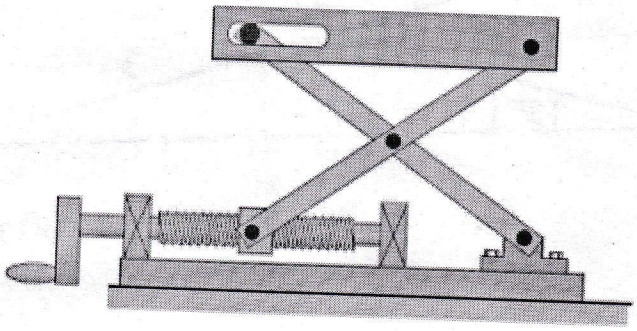


Figure 1

Q.2) a) A reciprocating engine has crank 200 mm long and connecting rod is 800 mm long. The crank rotates with uniform speed of 1440 rpm and it is just past IDC by 45°. Determine velocity of piston, acceleration of piston, angular velocity of connecting rod and angular acceleration of connecting rod. (Use analytical method) [6]

OR

b) In a slider crank mechanism having obliquity ratio n, show that the ratio of piston acceleration at the beginning of stroke and at the end of stroke is given by $\left(\frac{1+n}{1-n}\right)$. Assume uniform crank speed. [6]

Q.3) a) The mechanism shown in the figure 2 is driven by link 2 at 45 rad/sec in counter clockwise direction. Find the angular [6]

velocities of link 3 and 4 using relative velocity method. Take length of link 1 = 10 cm, link 2 = 4 cm, link 3 = 10 cm and link 4 =12 cm.

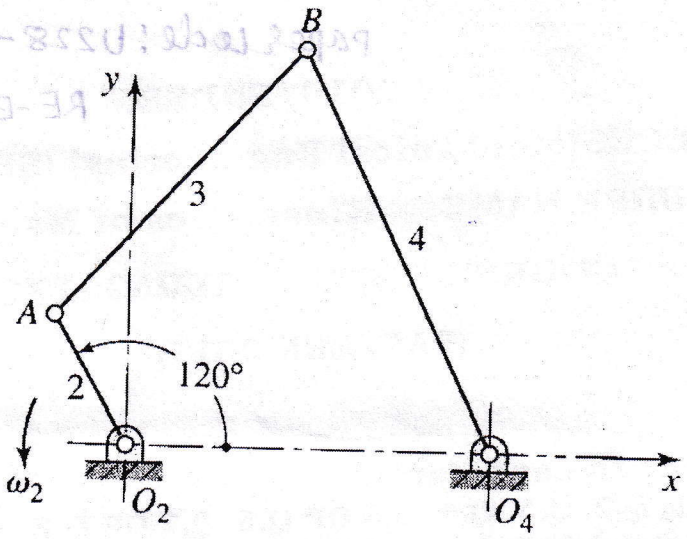
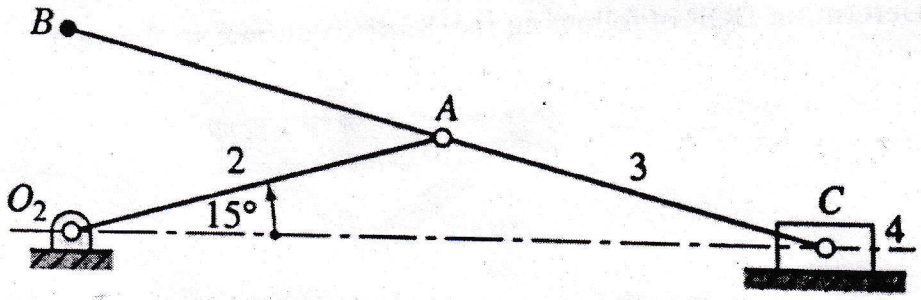


Figure 2

OR

b) For the straight line mechanism illustrated in figure 3, $\omega_2 = 20\,rad/sec$ CW and $\alpha_2 = 140\,rad/sec^2$ CW. Determine velocity of B using ICR method. [6]



$$R_{AO_2} = R_{CA} = R_{BA} = 100 \text{ mm}.$$

Figure 3

Q.4) a) Write steps to perform acceleration analysis of a mechanism using relative polygon method. [4]

OR

b) Write a short note on Coriolis component of acceleration [4]

Q.5) a) For the function $y = x^2$. Where, x varies from 0 to 4. Angle of driving link varies from 40° to 105° and angle of driven link varies from 50° to 150°. Determine Chebychev spacing. [6]

b) Solve K using Freudenstein's equation for **Q. 5. a**. [4]

c) Assume length of fixed link as unity; calculate lengths of various links of four bar mechanism for **Q. 5 b**. [4]

OR

Q.6) a) Synthesis a four bar mechanism to move a rigid body AB successfully through three position given by the figure 4: [6]

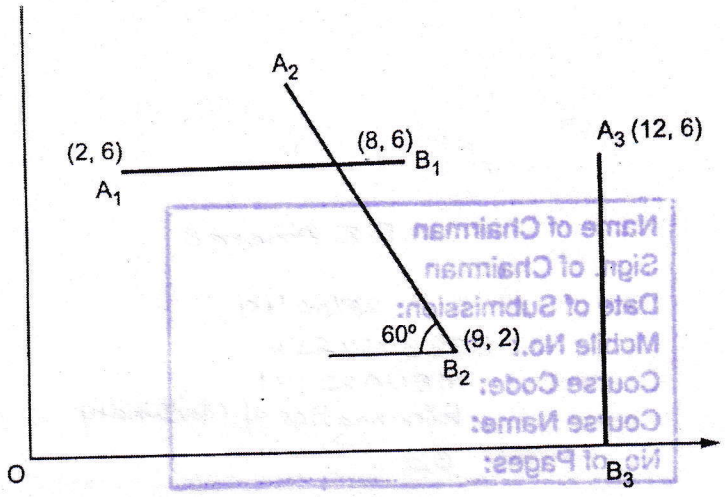


Figure 4

b) Determine the Chebychev spacing for function $y = log_{10}x$ in the interval $1 \leq x \leq 5$, where three precision points are required to be considered. [4]

c) Write procedure to synthesize a four bar mechanism using three position inversion method. [4]

Q.7) a) A disc cam is to give outstroke of 50 mm to an inline knife edged follower with SHM during first 90° cam rotation. Follower will return with 120° cam rotation with uniform acceleration and retardation. Follower will have two equal dwell intermediately during rise and return. Take base circle diameter = 50mm
Represent displacement diagram for the given data. [4]

b) Show required cam terminology [4]

c) Draw the desired cam profile [6]

OR

Q.8) a) A cam has to give motion to a roller follower of 10 mm diameter as defined below: [4]

Minimum radius of the cam 40 mm, Outward stroke of 30 mm during 120° cam rotation with uniform velocity, Dwell for 50° cam rotation, Return during 120° cam rotation using SHM, Follower to dwell for remaining cam rotation.

Draw Displacement diagram with suitable scale

b) Draw required cam and follower arrangement [4]

c) Draw cam profile when roller follower axis passes through the axis of cam. [6]