Total No. of Questions – [08] Total No. of Printed Pages 04

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MAY 2019/ENDSEM REEXAM

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 classification of kinematic pairs. [6]

OR

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

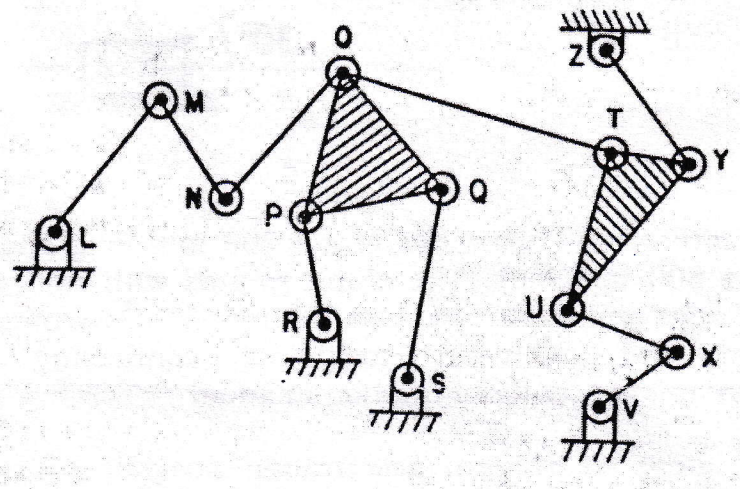

Figure 1

Q.2) a) Derive the expression for calculating velocity of piston in single slider crank mechanism. [6]

OR

b) Determine angular velocities of link 3 and 4 using complex algebra method for figure 2. [6]
Take $r_1 = 250\ mm,\ r_2 = 100\ mm,\ r_3 = 367\ mm,\ r_4 = 300\ mm,\ \theta_2 = 120°,\ \theta_3 = 35.37°, \theta_4 = 210°\ and\ \omega_2 = 45\ rad/sec$

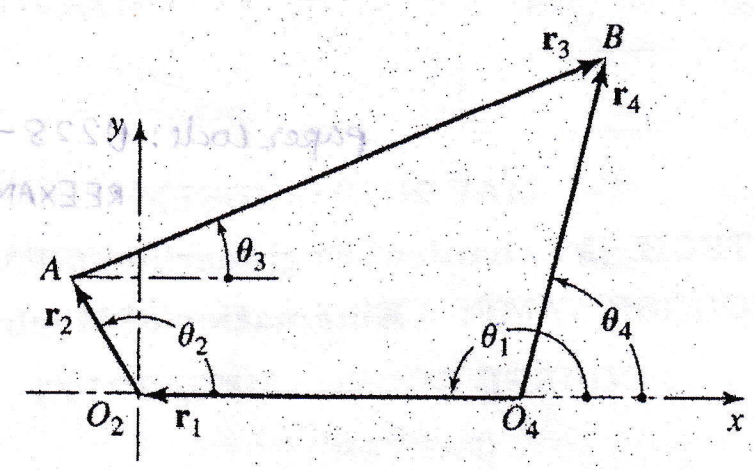

Figure 2

Q.3) a) The velocity of point *B* on the linkage illustrated in Figure 3 is **1 m/s**, the length of *AB* link is **1 m**. Find the velocity of point *A* and the angular velocity of link 3 using relative polygon method. [6]

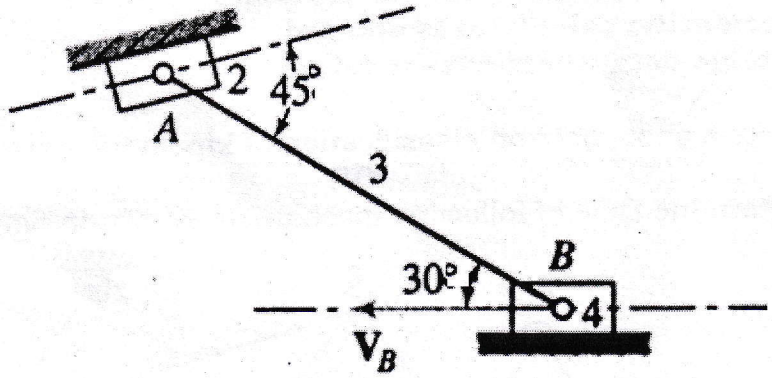

Figure 3

OR

b) 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 and angular velocity of connecting rod using instantaneous center of rotation method. [6]

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

OR

b) In figure 4 block 3 slides outward on link 2 at a uniform rate of 30 m/s, while link 2 is rotating at a constant angular velocity of 50 rad/s CCW. Determine the total acceleration of point A of the block. [4]

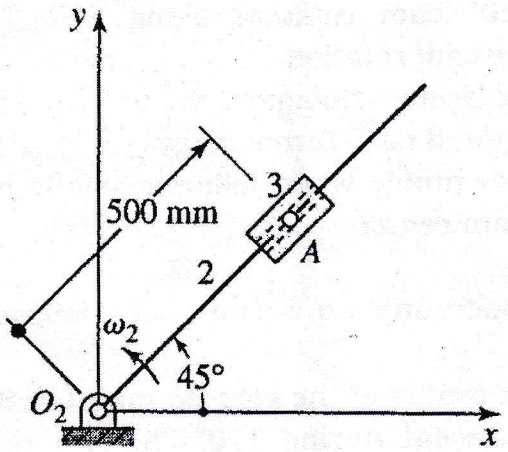

Figure 4

Q.5) a) For the function $y = x + 2$. Where x varies from 1 to 5. Angle of driving link varies from 10° to 170° and angle of driven link varies from 20° to 100°. 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 5: [6]

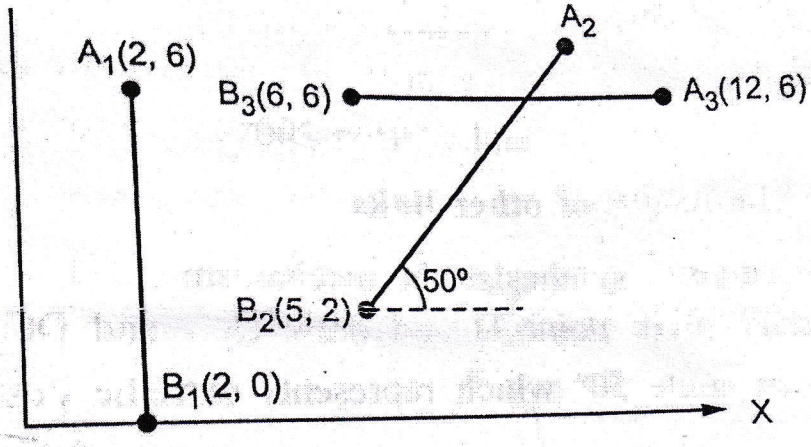

Figure 5

b) Apply three position inversion method to synthesize a four bar mechanism, for the following given data: [4]
θ for three precision positions are 45°, 75° and 135°
ø for three precision positions are 45°, 75° and 135°

c) Determine lengths of various links for **Q. 6. b.** [4]

Q.7) a) Following details are given for a knife edge follower: Minimum radius of the cam 30 mm, Outward stroke of 40 mm during 150° cam rotation with SHM, Dwell for 40° cam rotation, Return [4]

during 90° cam rotation using SHM, Follower to dwell for remaining cam rotation.
Draw displacement diagram

b) Draw required cam Terminology [4]

c) Draw Cam profile when follower axis is offset by 10 mm to the right of cam center. [6]

OR

Q.8) a) A cam operating an inline roller follower and with following details: [4]
Minimum radius of the cam 25 mm, Lift 30 mm, Roller diameter 15 mm, Ascent during 120° cam rotation, Dwell for 30° cam rotation, Descent during 120° cam rotation, Follower to dwell for remaining cam rotation, During ascent and descent follower moves with uniform velocity
Draw displacement diagram

b) Draw required cam Terminology [4]

c) Draw cam profile [6]