Total No. of Questions – [08] Total No. of Printed Pages 3

G.R. No.	

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MAY 2019/ENDSEM

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) Explain with sketch Ackerman's steering gear mechanism. [6]

OR

b) Identify following inversion of mechanism shown in figure 1. [6] Redraw the mechanism and explain its working in detail

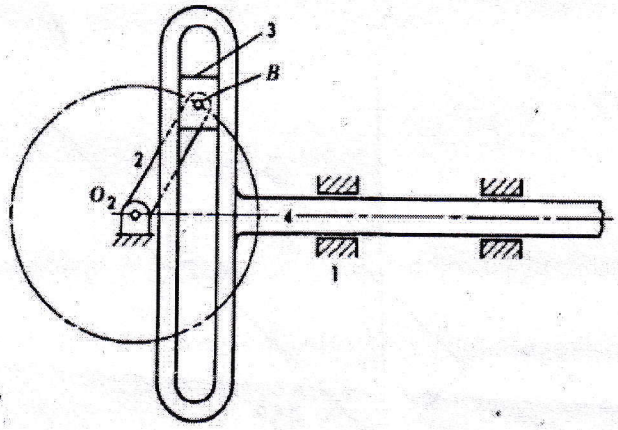

Figure 1

Q.2) a) In a slider crank mechanism length of crank is 100 mm and obliquity ratio is 4.5. The crank rotates with uniform speed of 100 rpm. Determine maximum velocity of piston. [6]

OR

b) State and prove loop closure equation for four bar mechanism. [6]

Q.3) 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 and angular velocity of connecting rod using relative velocity method. [6]

OR

b) For the circular cam in the posture as shown figure 2, the angular velocity of the cam is ω_2 = 15 rad/s ccw. There is rolling contact between the cam and the roller, link 3. Find the angular velocity of the oscillating follower, link 4. (Use ICR Method) [6]

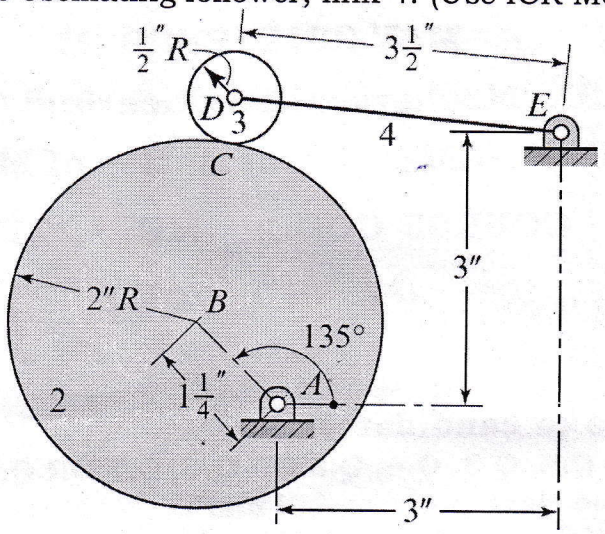

Figure 2

Q.4) a) Write a short note on acceleration image principle. [4]

OR

b) In figure 3 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]

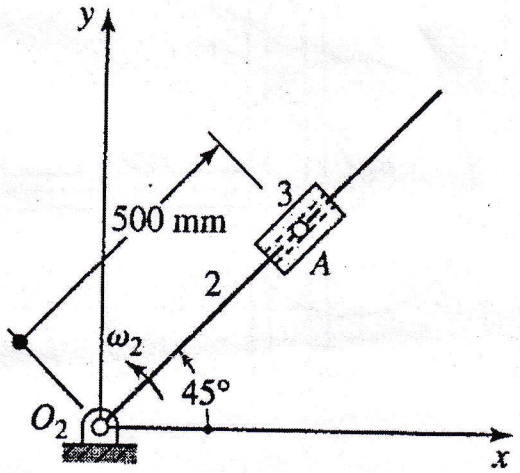

Figure 3

Q.5) a) For the function $y = e^x$. Variable x varies from 0 to 10. Angle of driving link varies from 30° to 120° and angle of driven link varies from 45° to 135°. [6]
Determine Chebychev spacing.

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) Coordinates of three successive position are given in the following table: [6]

	A	B
Position 1	2, 1	5, 1
Position 2	2, 3	5, 3
Position 3	1.5, 5	1.5, 8

Synthesis a four bar mechanism to move AB through the given position using body guidance graphical approach.

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 20°, 40° and 60°

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

Q.7) a) A cam operating an inline flat faced follower and with following details: Minimum radius of the cam 30 mm, Lift 45 mm, Ascent during 90° cam rotation, Dwell for 70° cam rotation, Descent during 150° cam rotation, Follower to dwell for remaining cam rotation, During ascent and descent follower moves with SHM. Draw displacement diagram [4]

b) Draw required cam Terminology [4]

c) Draw 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]