



	InSem Examination-II Summer 2024		
	Exam Seat No.:		
	Academic Year: 2023-2024	Semester: IV	
	Name of Programme: S. Y. B. Tech	Pattern: 2022	
	Name of Course: Robot Kinematics and Dynamics	Course Code: ROB222011	
	Max. Marks: 30	Duration: 1	

	<p>Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.</p> <ol style="list-style-type: none">1. This question paper contains _____ page(s).2. Answer to each new question is to be started on a new page.3. Assume suitable data wherever required, but justify it.4. Draw the neat labelled diagrams, wherever necessary.5. The last column indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.	
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Question No. 1 Attempt following Question

- a) (a) Four bar mechanism is to be designed to generate a function $y = x^2 + 10$ for $1 \leq x \leq 5$ at three precision points. Input link rotates from 30° to 120° and output link rotates from 60° to 150° . Determine the (7) CO1
- (i) Position of the three precision point
- (ii) Angular position of input link corresponding to first precision point
- (iii) Angular position of output link corresponding to first precision point

OR

- b) In an epicyclic gear train, Sun gear has 60 teeth and rotates at 200 rpm, Annulus wheel has 100 teeth and is held stationary. Determine the speed of the arm. (7) CO1
- c) In a slider crank mechanism the crank rotates at an angular speed of 20 rad/sec. The line of stroke of the slider is offset by perpendicular distance of 25 mm. Crank length is 200 mm and length of connecting rod is 600 mm. For 50° inclination of the crank calculate: (8) CO1
- (i) The distance of the slider from the crank center
- (ii) Angular position of the connecting rod

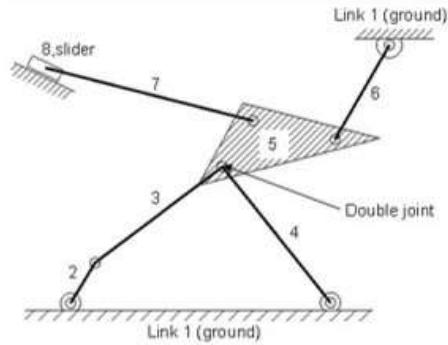
OR

- d) What do you mean by inversion of mechanism? Explain any two inversions of single slider crank chain. (8) CO1

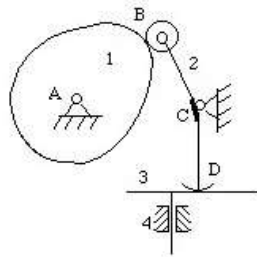
Question No. 2 Attempt following Question

Determine degree of freedom of following mechanisms:

(i)



(ii)



a)

(7) CO2

OR

b)

Explain with neat sketches the classification of robots based on workspace geometry.

(7) CO2

c)

One axis of a RPL robot is a linear slide with a total range of 800 mm. It has linear encoder with a screw of 15 mm pitch and emits 1000 pulses per revolution. The robot controller memory has 10 bit capacity. The mechanical errors for 5 measurements are shown in Table below:

(8) CO2

[8]

Measurement No.	P1	P2	P3	P4	P5
Error (mm)	0.015	0.007	0.010	0.012	0.016

Determine:

(i) The control resolution for the axis

(i) The spatial resolution of axis

(ii) The defined accuracy

(iii) Repeatability

OR

d)

A pneumatic gripper has a cylinder of piston diameter 20 mm and required stroke length is 50 mm. The gripper force is 300 N, Determine the motor power required in HP if it runs with 60 rpm.

(8) CO2

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