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GUJARAT TECHNOLOGICAL UNIVERSITY ME – SEMESTER II– EXAMINATION – WINTER - 2016

Subject Code: 2720910

Subject Name: ADVANCED MECHANISM DESIGN

Time: 2:30 pm to 5:00 pm

Total Marks: 70

Date: 17/11/2016

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- **Q.1** (a) Make the position analysis of the sliding block linkage shown in Fig 1, by finding **08** θ_4 and the distance O₄A. Using Analytical approach and Complex algebraic approach. Consider O₄O₂ =230mm, O₂A= 115mm, θ_2 =135°.



(b) Fig.2 shows the lift table used to adjust the working height of the different objects. 06 Draw kinematic diagram and compute the degree of freedom.



- **Q.2** (a) Explain the following terms.
 - Mechanism
 - Inversion
 - Preloaded structure.
 - Number synthesis.
 - Transmission angle.
 - Mobility
 - Jerk
 - (b) What is the physical meaning of DH parameters? Explain Denavit-Hartenberg 07 algorithm to represent the kinematics of a robot.

OR

(b) Explain Inverse Kinematics of a Two Link Manipulator with considering 07 geometric approach.

07

Q.3 (a) Calculate the angular velocity and angular acceleration of Link 4 shown in Fig.3, 08 $\alpha 4$, when the input angular acceleration, $\alpha_2 = 0 \text{ rad/s}^2$, $\omega_2 = 1 \text{ rad/s}$, $\omega 3 = -0.54 \text{ rad/s}$, $\theta_2 = 30^\circ$, $3 = 35.4^\circ$ and $\theta 4 = 84.4$. Use analytical method.





(b) Write the DH Parameters table for Three-link Planar Arm shown in Fig 4.

06



- Q.3 (a) Explain the Velocity analysis of the Four bar Inverted slider crank linkage using 08 analytical method.
 - (b) Develop DH parameter table for example having three revolving joint as shown in 06 Fig.5.



- Q.4 (a) Explain chebyshev spacing method for locating precision position in four bar 06 mechanism.
 - (b) Synthesize the 4-bar mechanism using Frudenstein's equation to meet the **08** following instantaneous conditions of input output links.

 $\theta = 60^{\circ}, \ \Phi = 90^{\circ}, \ \alpha_2 = -1 \text{ rad/sec}^2, \ \alpha_4 = 0, \ \omega_2 = 3 \text{ rad/sec}^2, \ \omega_4 = 2 \text{ rad/sec}^2.$

OR

Q.4	(a)	Explain the two position synthesis of four linkages using graphical synthesis.	06
	(b)	Explain: (1) Center-point and Circle-point circles, (2) Coupler curve synthesis	08
Q.5	(a)	Explain the two position motion generation by Analytical synthesis.	07
	(b)	Explain Euler Savary equation for location of the conjugate point.	07
		OR	
Q.5	(a)	Explain analytical synthesis of four bar function generation	07
	(b)	Explain the Bobillier's construction for the inflection circle of a four bar linkage.	07