Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III EXAMINATION – WINTER 2015

Subject Code:130103 **Date:18/12/2015**

Subject Name: Analysis of Mechanisms & Machine elements

Time: 2:30pm to 5:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	With the help of neat sketches explain inversions of four bar chain mechanism.	**07**
	(b)	Give the classification of kinematic pairs with neat sketches.	**07**
Q.2	**(a)**	Define the following terms: (i) Kinematic link (ii) Kinematic pair (iii) Degree of freedom (iv) Kinematic chain (v) Inversion (vi) Kinematics (vii) Rigid body.	**07**
	(b)	Differentiate between mechanism and machines. Define: Rigid body and Resistant body.	**07**
		OR	
	(b)	Explain Kennedy's theorem. Define: class-I and class-II mechanisms.	**07**
Q.3	**(a)**	PQRS is a four bar chain mechanism with link PS is fixed. The lengths of the links are PQ= 62.5mm, QR = 175 mm, RS = 112.5 mm, PS = 200mm. The crank PQ rotates at 10 rad / sec in clockwise direction. Draw the velocity and acceleration diagram when angle QPS = 60^0, S and R lie on same side of RS. Find the angular velocity and angular acceleration of link QR & RS.	**07**
	(b)	Explain stress-strain diagram for ductile and brittle material.	**07**
		OR	
Q.3	**(a)**	A hollow shaft transmits 600 kW at 500 rpm. The maximum shear stress is 62.4 MPa. Find the outside and inside diameter of the shaft, if the outer diameter is twice the inside diameter, assuming that the maximum torque is 20% greater than the mean torque.	**07**
	(b)	Derive the equation which shows the strength of hollow shaft and solid shaft having same outside diameters and material with usual notations.	**07**
Q.4	**(a)**	A single riveted butt joint is made of 10 mm thick plates with 20 mm diameter with a pitch of 60 mm. Calculate efficiency of joints if σ_t =100 Mpa , σ_c =100 Mpa , τ =100 Mpa.	**07**
	(b)	A plate of 16 mm thick is joined by a double riveted lap joint. The pitch of each row of rivet is 10 mm. The rivets are 25 mm diameter. The permissible shear stress are σ_t =140 Mpa, σ_c =240 Mpa, τ =110 Mpa.	**07**
		OR	
Q.4	**(a)**	Explain different modes of failures of a riveted joint with neat sketches.	**07**
	(b)	Explain the Klein's construction method with diagram for finding velocity and acceleration of the reciprocating parts in engines.	**07**

Q.5	**(a)**	Explain in detail: (i) D'Almbert's principle (ii) Principle of virtual work.	**07**
	(b)	Draw the stress distribution diagrams for thick cylindrical shell subjected to an internal pressure. Write down the different equations used for designing thick cylindrical shell.	**07**

OR

Q.5	**(a)**	Define the following terms: (a) Impact stress (b) Volumetric strain (c) Bulk modulus (d) Poission's ratio (e) Principle stress (f) Factor of safety (g) Bearing stress.	**07**
	(b)	A line shaft is rotating at 200 rpm is to transmits 20 kW. The allowable shear stress for the material of shaft is 42 MPA. If the shaft carries of central load of 900 N and is simply supported between bearing 3m apart, determine the diameter of shaft. The maximum tensile and compressive stress is not exceeding 56 MPA.	**07**

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