Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) • EXAMINATION – SUMMER 2015

Subject Code: 2130103 **Date: 27/05/2015**

Subject Name: Analysis of Mechanism & Machine Elements

Time: 02.30pm-05.00pm **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)**	Explain stress-strain diagram.	**07**
	(b)	Explain different kinds of kinematic pairs giving example for each one of them.	**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)	Classify different types of riveted joint. Explain Caulking and Fullering.	**07**
		OR	
	(b)	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**
Q.3	**(a)**	What is a machine? Giving example, differentiate between a machine and a structure.	**07**
	(b)	A double riveted double cover butt joint in plates 20 mm thick is made with 25 mm diameter rivets at 100 mm pitch. The permissible stresses are : σ_t = 120 MPa; τ = 100 MPa; σ_c = 150 MPa Find the efficiency of joint, taking the strength of the rivet in double shear as twice than that of single shear.	**07**
		OR	
Q.3	**(a)**	Make out a systematic classification of pressure vessels.	**07**
	(b)	Find the thickness for a tube of internal diameter 100 mm subjected to an internal pressure which is 5/8 of the value of the maximum permissible circumferential stress. Also find the increase in internal diameter of such a tube when the internal pressure is 90 N/mm^2. Take E = 205 kN/mm^2 and μ = 0.29. Neglect longitudinal strain.	**07**
Q.4	**(a)**	Derive an expression for the inertia force due to reciprocating mass in reciprocating engine, neglecting the mass of the connecting rod.	**07**
	(b)	Find the diameter of a solid steel shaft to transmit 20 kW at 200 rpm. The ultimate shear stress for the steel may be taken as 360 MPa and a FOS as 8. If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameter when the ratio of inside to outside diameters is 0.5.	**07**
		OR	
Q.4	**(a)**	A solid circular shaft is subjected to a bending moment of 3000 N-m a torque of 10000 N-m. The shaft is made of 45C8 steel having ultimate tensile stresses of 700 MPa and an ultimate shear stress of 500 MPa. Assuming a factor of safety as 6, determine the diameter of shaft.	**07**
	(b)	State Alembert's principle. How it helps in solving dynamic analysis problem?	**07**

Q.5 **(a)** In a four bar chain ABCD, AD link is fixed and is 150 mm long. The crank AB is 40mm long and rotates at 120 rpm in clockwise direction, while the link CD = 80 mm oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD = 60°. **07**

(b) In an ABCD four bar chain mechanism, AB = 300 mm, BC = CD = 360 mm, and AD = 600 mm. The angle BAD = 60°.The crank AB rotates uniformly at 100 r.p.m.in clockwise direction. Locate all the instantaneous centers and find the angular velocity of the link BC. **07**

OR

Q.5 **(a)** Locate all the I- centers of the slider crank mechanism as shown in Fig.1. The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates in clockwise with an angular velocity of 10 rad/s, find out: 1. Velocity of the slider A, and 2. Angular velocity of the connecting rod AB. **07**

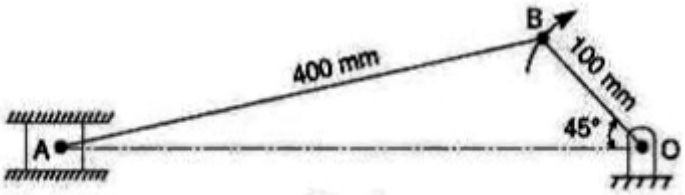

Fig-1

(b) With help of neat sketch explain Whitworth quick return mechanism **07**

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