Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (New) EXAMINATION – WINTER 2015

Subject Code:2130103 Date:18/12/2015

Subject Name: Analysis of Mechanisms and 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 Short Questions **14**

1 In a thick cylindrical shell, the maximum radial stress at the outer surfaces of the shell is?

2 A lap joint is always in _____ shear.

a) single b) double

3 For what type of materials the shear stress theory is used?

4 The main objective of caulking in a riveted joint is to make joint

a) stronger in tension c) free from stresses
b) leak-proof d) free from corrosion

5 In case of thick cylinders, the tangential stresses acting on outer surface of shell are

a) maximum c) minimum
b) zero d) equal

6 The stress produced in member due to falling load is known as:

a) shear stress c) tensile stress
b) impact stress d) compressive stress

7 Which of the following loading is considered for design of axles?

a) twisting c) bending
b) axial d) all of above

8 The distance between the centre of rivet and edge of plate is termed as:

a) back pitch c) head
b) diagonal pitch d) margin

9 What do you mean by rigid body?

10 When can you say the pressure vessel is thin?

11 What do you mean by transmission shaft?

12 How many degrees of freedom does the rolling pair have?

13 What do you mean by resistant body?

14 State principle of superposition.

Q.2 **(a)** Define the following terms: **03**

(i) Kinematic link
(ii) Kinematic pair
(iii)Degree of freedom

(b) A double riveted double cover butt joint is made in 12 mm thick plates with 18 mm diameter rivets. Find the efficiency of the joint for a pitch of 80 mm. Take permissible tensile, shear and crushing stresses 115 MPa, 80 MPa and 160 MPa respectively. **04**

	(c)	With help of neat sketch explain Whitworth quick return mechanism.	**07**
		OR	
	(c)	With help of neat sketches explain inversions of four-bar chain mechanism.	**07**
Q.3	**(a)**	Define following terms: (i) Spindle (ii) Axle (iii)Shaft	**03**
	(b)	With help of sketch explain Kennedy's theorem.	**04**
	(c)	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.3	**(a)**	State Principle of virtual work	**03**
	(b)	Design a suitable diameter for a circular shaft required to transmit 90 kW at 180 rpm. The shear stress in the shaft is not to exceed 70 MPa and the maximum torque exceeds the mean by 40%.	**04**
	(c)	With help of neat sketches explain inversions of slider-crank mechanism.	**07**
Q.4	**(a)**	Define Centrode and enlist its types.	**03**
	(b)	Explain in brief Class-I and Class-II mechanisms with neat sketches.	**04**
	(c)	Give detailed classification of Pressure vessels with neat sketches.	**07**
		OR	
Q.4	**(a)**	Enlist different modes of failures of riveted joints with neat sketches.	**03**
	(b)	A single riveted double cover butt joint is made in 10 mm thick plates with 20 mm diameter rivets with a pitch of 60 mm. Calculate efficiency of the joint if, σ_t = 100 MPa, σ_c = 160 MPa and τ = 80 MPa.	**04**
	(c)	Classify different types of riveted joint. Explain Caulking and Fullering.	**07**
Q.5	**(a)**	Enlist different types of stresses induced in machine parts.	**03**
	(b)	Draw the tangential stress and radial stress distribution diagrams for thick cylindrical shell subjected to an internal pressure.	**04**
	(c)	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**
		OR	
Q.5	**(a)**	Define following stresses: (i) Tensile stress (ii) Shear stress (iii) Compressive stress.	**03**
	(b)	A solid circular shaft is subjected to a bending moment of 3000 N-m and a torque of 10000 N-m. The shaft is made of 45C8 Steel having ultimate tensile stress of 700 MPa and a ultimate shear stress of 500 MPa. Assuming a factor of safety as 6, determine the diameter of the shaft.	**04**
	(c)	Explain in detail: (i) D'Almbert's principle (ii) Principle of virtual work.	**07**

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