

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-III • EXAMINATION – SUMMER • 2014

Subject Code: 130103**Date: 23-05-2014****Subject Name: Analysis of Mechanisms and Machine Elements****Time: 02.30 pm - 05.00 pm****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) Define the following terms: **07**
 (i) Kinematic link (ii) Kinematic pair (iii) Degree of freedom (iv) Kinematic chain (v) Inversion (vi) Kinematics (vii) Rigid body.

(b) Classify different types of riveted joint. Explain Caulking and Fullering. **07**

Q.2 (a) Define the following terms: **07**
 (a) Impact stress (b) Volumetric strain (c) Bulk modulus (d) Poisson's ratio (e) Principle stress (f) Factor of safety (g) Bearing stress.

(b) Explain in detail: (i) D'Alembert's principle (ii) Principle of virtual work. **07**

OR

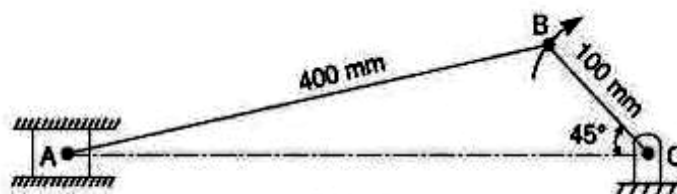
(b) With help of neat sketch explain Whitworth quick return mechanism. **07**

Q.3 (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 r.p.m. 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.3 (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) An engine mechanism is shown in Fig.2. The crank CB = 100 mm long and the connecting rod BA = 300 mm long. Centre of gravity G is 100 mm from B. In the position shown, the crankshaft has a speed of 75 rad/s and an angular acceleration of 1200 rad/s². Find: 1. Velocity of G and angular velocity of AB, and 2. Acceleration of G and angular acceleration of AB. **07**

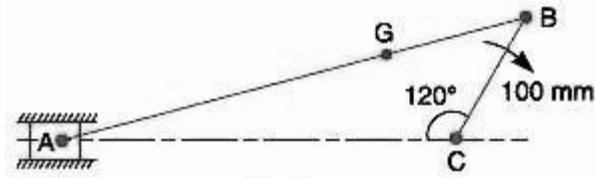


Fig.2

- Q.4** (a) Explain Klein's construction for slider crank mechanism. **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 : $\sigma_t = 120$ MPa; $\tau = 100$ MPa; $\sigma_c = 150$ 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.4** (a) Find the thickness for a tube of internal diameter 100 mm subjected to an internal pressure which is $\frac{5}{8}$ 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 $E = 205 \text{ kN/mm}^2$ and $\mu = 0.29$. Neglect longitudinal strain. **07**
 (b) Find the diameter of a solid steel shaft to transmit 20 kW at 200 r.p.m. The ultimate shear stress for the steel may be taken as 360 MPa and a f.o.s. 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**

- Q.5** (a) Explain different kinds of kinematic pairs giving example for each one of them. **07**
 (b) What is a machine? Giving example, differentiate between a machine and a structure. **07**

OR

- Q.5** (a) Make out a systematic classification of pressure vessels and discuss the role of statutory regulations. **07**
 (b) Derive an expression for the inertia force due to reciprocating mass in reciprocating engine, neglecting the mass of the connecting rod. **07**
