

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. Sem-III Remedial Examination May 2011

Subject code: 130103

Subject Name: Analysis of Mechanism & Machine Elements

Date: 20-05-2011

Total Marks: 70

Time: 10.30 am – 01.00 pm

Instructions:

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

- Q-1** (a) Differentiate between mechanism and machines. And define rigid body and resistant body. **07**
(b) Explain about velocity images and centrode. **07**
- Q-2** (a) Classify different types of kinematic pairs and draw sketches of all. **07**
(b) With help of neat sketches explain inversions of slider-crank mechanism. **07**
OR
(b) With help of neat sketches explain inversions of four-bar chain mechanism. **07**
- Q-3** (a) Explain simple stresses: (i) tensile stress (ii) compressive stress (iii) shear stress (iv) crushing stress, and (v) bearing stress. **07**
(b) A shaft is transmitting 100 kW at 180 r.p.m. If the allowable stress in the material is 60 MPa, find the suitable diameter for the shaft. The shaft is not to twist more than 1° in a length of 3 meters. Take $C = 80 \text{ GPa}$. **07**
OR
- Q-3** (a) Explain stress-strain diagram. **07**
(b) Design a suitable diameter for a circular shaft required to transmit 90 kW at 180 r.p.m. The shear stress in the shaft is not to exceed 70 MPa and the maximum torque exceeds the mean by 40%. Also find the angle of twist in a length of 2 meters. Take $C = 90 \text{ GPa}$. **07**
- Q-4** (a) With help of sketch explain Kennedy's theorem. **05**
(b) Fig. 1 shows the link mechanism of a quick return mechanism of the slotted lever type. For the configuration shown determine the velocity of the cutting tool at S and the angular velocity of the link RS. The crank OP rotates at 210 rpm. Take angle $\text{OAR} = 15^\circ$. **09**

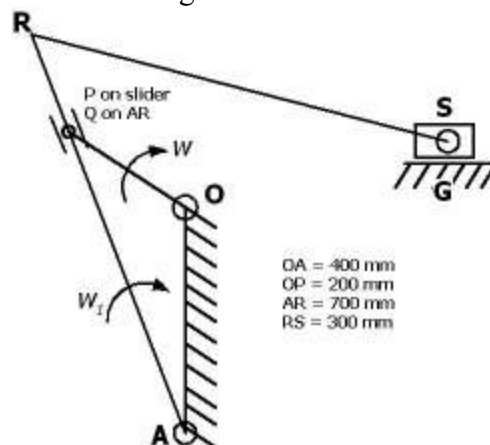


Fig. 1

OR

- Q-4. (a) Explain KLEIN'S construction. 05
 (b) For the mechanism shown in Fig. 1, find out acceleration of point E and rubbing velocities at all the joint for equal radii of 20 mm. Take angular velocity of crank AB equal to 20 rad / s in counter clockwise direction. 09

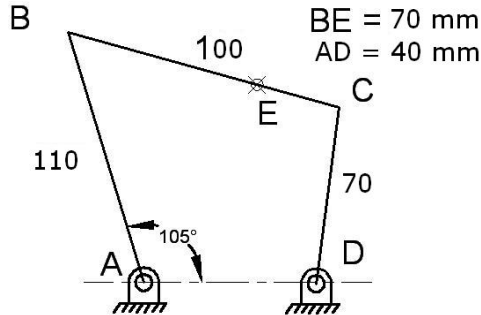


Fig. 2

- Q-5 (a) Two plates, each 5 mm thick, are connected by means of four rivets as shown in Fig. 3. Permissible stresses for rivets and plates in tension, shear and compression are 80 N/mm², 60 N/mm² and 120 N/mm² respectively. Calculate (a) diameter of the rivets (b) width of the plate and (c) efficiency of the joint. 07

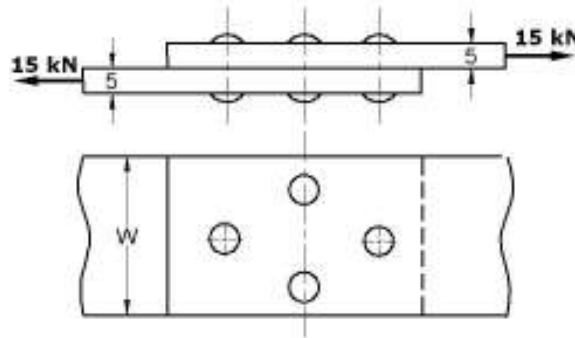


Fig. 3

- (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. 07

OR

- Q-5 (a) (i) Explain caulking and fullering. 03
 (ii) 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
 (b) A cylindrical shaft made of steel of yield strength 700MPa is subjected to static loads consisting of a bending moment of 10kN-m and a Torsional moment of 30kN-m. Determine the diameter of the shaft assuming a factor of safety of 2. 07
