

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE SEM-III Examination-Dec.-2011

Subject code: 130103

Date: 13/12/2011

Subject Name: Analysis of Mechanism and Machine Element

Time: 2.30 pm -5.00 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) Differentiate between mechanism and machines. And define rigid body and resistant body. 07
- (b) Classify different types of kinematic pairs and draw sketches of all . 07

- Q.2 (a) Explain Kennedy's theorem. And define class-I and class-II mechanisms. 07
- (b) Differentiate between mechanism and machines. And define rigid body and resistant body. 07

OR

- (b) With help of neat sketches explain inversions of slider-crank mechanism.

- Q.3 (a) For the mechanism shown in Fig. 1, draw velocity diagram and find out absolute velocity of point E and rubbing velocities at all the joint for equal radii of 25 mm. Take angular velocity of crank AB equal to 30 rad / s in clockwise direction. 07

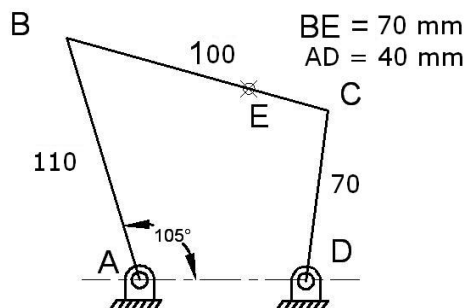


Fig. 1

- (b) For the mechanism shown in Fig. 1 (Q-3, a), draw acceleration diagram and find out the absolute acceleration of point B and E. 07

OR

- Q.3 (a) With help of neat sketches explain Quick-return mechanism 07
- (b) Explain: velocity images, centrode and Grashof's law. 07

- Q.4 (a) What do you mean by piston effort and crank effort? Give their expression as per usual notations. 06

- (b) The crank and connecting rod of a vertical petrol engine, running at 1800 rpm are 60 mm and 270 mm respectively. The diameter of the piston is 100 mm and the mass of the reciprocating parts is 1.2 kg. During the expansion stroke 08

when the crank turned 20° from top dead center, the gas pressure is 650 kN/m^2 . Determine (a) the net force on the piston (b) the net load on the gudgeon pin (c) the thrust on the cylinder wall (d) the speed at which the gudgeon pin load is reversed in direction.

OR

- Q.4 (a) Deduce the expression of inertia force on the piston of a slider crank mechanism in terms of angular velocity of the crank, length of crank and connecting rod and mass of piston. 02
- (b) State D'Alembert's principle. How it helps in solving dynamic analysis problem? 02
- (b) A horizontal gas engine running at 210 rpm has a bore of 220 mm and a stroke of 440 mm. The connecting rod is 924 mm long and the reciprocating parts weight 20 kg. When the crank has turned through an angle of 30° from the inner dead centre, the gas pressure on the cover and the crank sides are 500 kN/m^2 and 60 kN/m^2 . The diameter of piston rod is 40 mm. Determine, 10
- turning moment on the crank shaft,
 - thrust on the bearing,
 - Acceleration of the flywheel, which has a mass of 8 kg and radius of gyration of 600 mm. While the load is 22kN.

- Q.5 (a) A hollow shaft of 40 mm outer diameter and 25 mm inner diameter is subjected to a twisting moment of 120N-m, simultaneously; it is subjected to an axial thrust of 10 kN and a bending moment of 80 N-m. Calculate the maximum compressive and shear stresses. 07
- (b) Find the efficiency of the following riveted joints: 07
- Single riveted lap joint of 6 mm plates with 20 mm diameter having pitch of 50 mm.
 - Double riveted lap joint of 6 mm plates with 20 mm diameter rivets having a pitch of 65 mm.
- Assume: Permissible tensile stress in plate = 120 MPa, Permissible shearing stress in rivets = 90 MPa and Permissible crushing stress in rivets = 180 MPa.

OR

- Q.5 (a) A shaft is made of mild steel is required to transmit 100 kW at 300 rpm. The supported length of the shaft is 3 meters. It carries two pulleys each weighing 1500 N supported at a distance of 1 m from the ends respectively. Assuming the safe value of stress, determine the diameter of the shaft. 07
- (b) A double riveted lap joint is made between 15 mm thick plates. The rivet diameter and pitch are 25 mm and 75 mm respectively. If the ultimate stresses are 400 MPa in tension, 320 MPa in shear and 640 MPa in crushing, find the minimum force per pitch which will rupture the joint. If above joint is subjected to a load such that the factor of safety is 4, find out the actual stresses developed in the plates and the rivets. 07
