

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- IVth SEMESTER-EXAMINATION – MAY/JUNE- 2012****Subject code: 143401****Date: 23/05/2012****Subject Name: Machines and Mechanisms****Time: 10:30 am – 01:00 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) Explain the classification of kinematic pairs with neat sketches. **07**
(b) Explain the inversions of four bar mechanisms with neat sketches. **07**

- Q.2** (a) Explain Davis and Ackerman Steering Gear mechanisms. **07**
(b) Two shafts are connected by a universal joint. The driving shaft rotates at a uniform speed of 1200 r.p.m. Determine the greatest permissible angle between the shaft axes so that the total fluctuation of speed does not exceed 100 r.p.m. Also calculate the maximum and minimum speeds of the driven shaft. **07**

OR

- (b) A double universal joint is used to connect two shafts in the same plane. The intermediate shaft is inclined at an angle of 20° to the driving shaft as well as the driven shaft. Find the maximum and minimum speed of the intermediate shaft and the driven shaft if the driving shaft has a constant speed of 500 r.p.m. **07**

- Q.3** (a) Explain the classification of followers with neat sketches. **07**
(b) Explain the construction of cam profile for a radial cam. **07**

OR

- Q.3** (a) Explain the cam nomenclature with neat sketch. **07**
(b) Explain the uniform, simple harmonic and cycloidal motions of the follower with neat sketches. **07**

- Q.4** (a) A load of 10 kN is raised by means of a screw jack, having a square threaded screw of 12 mm pitch and of mean diameter 50 mm. If a force of 100 N is applied at the end of a lever to raise the load, what should be the length of the lever used? Take coefficient of friction = 0.15. What is the mechanical advantage obtained? State whether the screw is self-locking. **07**
(b) Explain single disc clutch and cone clutch with neat sketches. **07**

OR

- Q.4** (a) Explain the spur gear nomenclature with neat sketch. **07**
(b) An aeroplane makes a complete half circle of 50 meters radius, towards left, when flying at 200 km/hr. The rotary engine and the propeller of the plane have a mass of 400 kg and a radius of gyration of 0.3 m. The engine rotates at 2400 r.p.m. clockwise when viewed from the rear. Find the gyroscopic couple on the aircraft and state its effect on it. **07**

- Q.5** (a) A punching press is required to punch 40 mm diameter holes in a plate of 15 mm thickness at the rate of 30 holes per minute. It requires 6 N-m of energy per mm^2 of sheared area. If the punching takes 1/10 of a second and the r.p.m. of the flywheel varies from 160 to 140, determine the mass of the flywheel having radius of gyration of 1 m. **07**
- (b) A single cylinder reciprocating engine has speed 240 r.p.m., stroke 300 mm, mass of reciprocating parts 50 kg, mass of revolving parts at 150 mm radius 37 kg. If two-third of the reciprocating parts and all the revolving parts are to be balanced, find: 1. The balance mass required at a radius of 400 mm, and 2. The residual unbalanced force when the crank has rotated 60° from top dead centre. **07**
- OR**
- Q.5** (a) Four masses m_1 , m_2 , m_3 and m_4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45° , 75° and 135° . Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m. **07**
- (b) Draw the turning moment diagrams for a four stroke cycle internal combustion engine and multi-cylinder engine and explain. **07**
