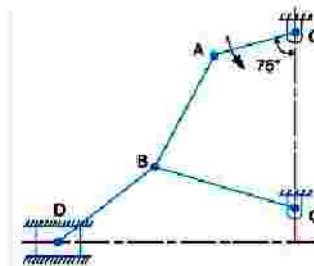


GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV • EXAMINATION – SUMMER 2013****Subject Code: 142001****Date: 19-06-2013****Subject Name: Kinematics and Dynamics of Machines****Time: 10:30am – 01:00pm****Total Marks: 70****Instructions:**

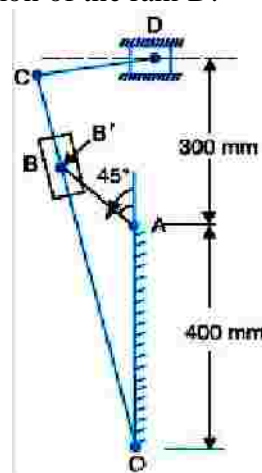
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain various inversions of a slider-crank mechanism with neat sketches. **07**
 (b) Explain Grubler's criterion for determining degree of freedom for mechanism. **07**

- Q.2** (a) The angular velocity of the crank OA is 600 rpm as shown in figure below. **07**
 Determine the linear velocity of the slider D and the velocity of the link BD, when the crank is inclined at an angle of 75° to the vertical. The dimensions of various links are
 OA = 28 mm, AB = 44 mm, BC = 49 mm, and BD = 46 mm.
 The center distance between the centers of rotation O and C is 65 mm. the path of travel of the slider is 11 mm below the fixed point C. the slider moves along a horizontal path and OC is vertical.



- (b) A mechanism of a crank and slotted lever quick return motion as shown in figure below. If the crank rotates clockwise at 120 rpm, determine the velocity and acceleration of the ram D. **07**

**OR**

- (b) What is cam? What is function of cam? Explain with neat sketch different types of cams. **07**

- Q.3** (a) Explain the phenomenon of 'creep' and 'slip' in a belt drive. **07**

- (b) Determine minimum number of teeth required on a pinion, in order to avoid interference, which is to gear with a wheel to give a gear ratio of 3:1. The pressure angle is 20° and a standard addendum of one module. **07**

OR

- Q.3** (a) Explain static and dynamic balancing. **07**
 (b) A cantilever shaft of 50 mm diameter and 300 mm long has a disc of mass 100 Kg at its free end. The Young's modulus for the shaft material is 200 GPa. Determine the frequency of longitudinal and transverse vibration of the shaft. **07**

- Q.4** (a) Explain the effect of gyroscopic couple on two wheeler. **07**
 (b) Draw the profile of a cam which raises a valve with SHM through 3 cm in $1/3$ of revolution, keep it fully raised through $1/12$ revolution and it is closed in next $1/3$ revolution with SHM. The valve remains closed during the rest of the revolution. The diameter of the roller is 1 cm and minimum radius of the cam is to be 2 cm. The axis of the valve rod is offset by 0.1 cm from the axis of the cam shaft. **07**

OR

- Q.4** (a) Derive an expression for length of the path of contact in a pair of meshed spur gears. **07**

- Q.4** (b) Draw the profile of a cam operating a knife edged follower when it lifts the follower through 40 mm during its 60° rotation with SHM, remains at rest for next 40° rotation of the cam, descends to its original position during 90° rotation of the cam with uniform acceleration and deceleration and remains at rest for the remaining rotation. The least radius of cam is 50 mm. **07**

- Q.5** (a) The four masses m_1 , m_2 , m_3 and m_4 having their radii of rotation as 200 mm, 150 mm, 250 mm and 300 mm are 200 Kg, 300 Kg, 240 g and 260 Kg in magnitude respectively. The angles between the successive masses are 45° , 75° , and 135° respectively. Find the position and angular position of the balance mass required, if its radius of rotation is 200 mm. **07**

- (b) The turbine rotor of a ship having a mass of 200 Kg rotates at 2000 rpm and its radius of gyration is 0.3 meter. If the rotation of the rotor is clockwise looking from the left, determine the gyroscopic couple set by rotor when **07**

(i) Ship takes a left turn at a radius of 300 meters at a speed of 30 Km/hr

(ii) Ship pitches with the bow rising at an angular velocity of 1 rad /sec.

OR

- Q.5** (a) Write a short note on vibration isolation and isolation materials. **07**

- (b) A cylinder of mass 4 Kg and radius 15 cm is connected to a spring of stiffness 4000 N/m as shown in figure below. It is free to roll on horizontal rough surface without slipping, determine the natural frequency of the system. **07**

