Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2015

Subject Code: 2142001 **Date:01/06/2015**

Subject Name: Kinematics and dynamics of machine

Time: 10:30am-1.00pm **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)** Enlist various inversions of Four bar chain mechanism & explain Watt's indicator mechanism with neat sketch. **07**

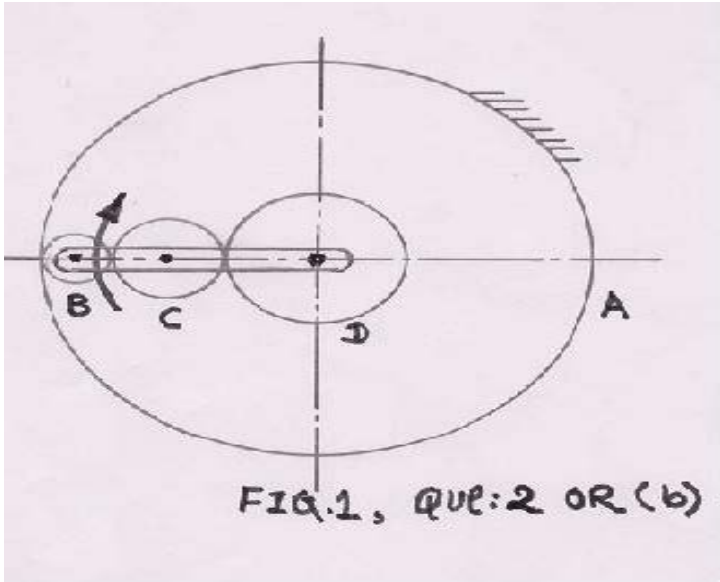
(b) Explain pantograph briefly. Also list the applications of pantograph. **07**

Q.2 **(a)** Explain the law of Gearing with neat sketch. **07**

(b) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20^0 pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, Arc of contact and the contact ratio. **07**

OR

(b) An epicyclic gear train, as shown in **Fig.1,** is composed of a fixed annular wheel **A** having 150 teeth. The wheel **A** is meshing with wheel **B** which drives wheel **D** through an idle wheel **C**, **D** being concentric with **A**. The wheel **B** and **C** are carried on an arm which revolves clockwise at 100 r.p.m. about the axis of **A** and **D** .If the wheel **B** and **D** have 25 teeth and 40 teeth respectively, Find the number of teeth on **C** and the speed and sense of rotation of **C**. **07**



Q.3 **(a)** Define the following terms: (1) Cam (2) Pressure angle (3) Lift of follower (4) Pitch curve (5) Module (6) Diametral pitch (7) Pitch point. **07**

(b) Design a cam to raise a valve with simple harmonic motion through 50 mm in 1/3 of a revolution, keep if fully raised through 1/12 revolution and to lower it with simple harmonic motion in 1/6 revolution. The valve remains closed during the rest of revolution. The diameter of the roller is 20 mm and minimum radius of the cam is 30 mm. The diameter of the cam shaft is 25 mm. The axis of the valve rod passes through the axis of the cam shaft. Draw the profile of the cam. **07**

OR

Q.3 (a) Derive an equation for the ratio of driving tensions for flat belt drive with neat sketch. **07**

(b) The turbine rotor of a ship has a mass of 9000 kg and radius of gyration 60 cm. It rotates 1600 r.p.m. clockwise, when looking from the stern. Determine the gyroscopic couple, If the ship travels at 90 km/h and steer to the left in a curve of 75 m radius. **07**

Q.4 (a) Explain the effects of Gyroscopic couple on an Aero plane with neat sketch. **07**

(b) A, B, C and D are four masses carried by a rotating shaft at radii 10, 12.5, 20 and 15 cm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg and 4 kg respectively. **07**

Find the required mass **A** and the relative angular settings of the four masses so that the shaft shall be in complete balance.

OR

Q.4 (a) Explain Klien's Construction using velocity and acceleration diagram. **07**

(b) A mechanism as shown in Fig. 2, Has the following dimensions: **07**

OA = 200 mm; AB = 1.5 m; BC = 600 mm; CD = 500 mm and BE = 400 mm. Locate all the instantaneous centers.

If crank OA rotates uniformly at 120 r.p.m. clockwise, **Find (1)** The velocity of B, C and D, **(2)** The angular velocity of the links AB, BC and CD.

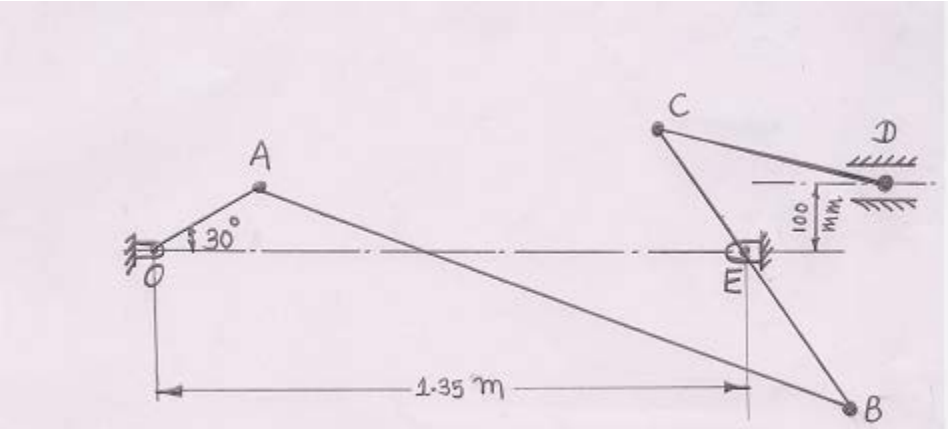


FIG.2, QUE:4 OR(b)

Q.5 (a) Explain coriolis Component of acceleration briefly. **07**

(b) A vibrating system consists of a mass 50 kg, a spring with a stiffness of 30 KN/m and a damper. The damping provided is only 20 % of critical value. Determine: (1) Damping factor (2) Critical damping coefficient (3) Natural frequency of damped vibrations (4) Logarithmic decrement (5) Ratio of two consecutive amplitudes. **07**

OR

Q.5 (a) Derive an equation of motion for forced damped vibration for single degree of freedom. **07**

(b) Explain Creep of the belt. Also differentiate Belt and Chain drive **07**

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