Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. Sem-IV Remedial Examination Nov/ Dec. 2010

Subject code: 142001

Subject Name: Kinematics and Dynamics of machines

Date: 09 / 12/ 2010 **Time: 03.00 pm – 05.30 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)** Define inversion of mechanism and discuss inversion of single slider crank chain mechanism. **07**

(b) What is centrifugal tension in the belt ? Derive the equation to find the length of open belt. **07**

Q.2 **(a)** Give the classification of kinematic pairs in details with example **07**

(b) O_2AB is slider crank mechanism. Crank O_2A= 40 mm , connecting road AB = 120 mm . angle AO_2B =45º . The crank rotates at constant angular velocity of 10 rad/sec. Find velocity and acceleration of mid point M of connecting rod AB. **07**

OR

(b) O_2ABO_4 is a four bar mechanism , the link dimensions are O_2A=40 mm , AB= 80 mm , O_2O_4=100 mm , O_4B =80 mm .The crank O_2A rotates at constant angular velocity of 10 rad/sec. Determine velocity and acceleration of mid point M of the link AB. Angle O_4O_2A =60º **07**

Q.3 **(a)** Differentiate between Involute and Cycloidal gear tooth profile. Explain law of gearing. **07**

(b) Draw the profile of a radial cam operating on a roller follower from the following data. **07**

The roller diameter = 20 mm , Cam shaft diameter=30 mm , The minimum and maximum distance between the roller centre and cam centre is 60 mm and 120 mm respectively , The cam is to lift the follower with equal uniform acceleration and retardation during 90º and then allows the follower to dwell for 60º of cam rotation and then returns with the simple harmonic motion during 120º and then dwells in the lowest position for the remaining period of cam rotation.

The cam rotates in clockwise direction with 360 r.p.m.

OR

Q.3 **(a)** Define and explain with neat sketch Base circle , Prime circle , Pressure angle , Pitch curve and Pitch point related to cam and follower **07**

(b) Draw the profile of a radial cam operating on a roller follower from the following data. **07**

The knife edge follower having off-set of 15 mm , Cam shaft diameter=30 mm , The minimum and maximum distance between the roller centre and cam centre is 60 mm and 130 mm respectively , The cam is to lift the follower with equal uniform acceleration and retardation during 1/24 seconds and then allows the follower to drop suddenly to a distance equal to half the lift and then returns with the simple harmonic motion during 1/14.4 seconds and then dwells in the lowest position for the remaining period of cam rotation.

The cam rotates in clockwise direction with 360 r.p.m.

Q.4 **(a)** Explain the effect of gyroscopic couple on Naval ship during steering , pitching and rolling. **07**

(b) A ,B , C and D are four masses attached on a shaft at radii 0.1 m , 0.225 m ,0.15 m and 0.15 m respectively. Planes in which masses revolve are spaced 0.6 m apart and weight of B,C and D are 10 Kg , 5.5 Kg and 3.6 Kg respectively. Find mass A and angular positions of all three masses if mass at B is making 0º. Take A as reference plane. **07**

OR

Q.4 **(a)** Define static balancing and dynamic balancing. State the necessary conditions to achieve them. **07**

(b) An aero plane flying at 240 Km/hr. turns towards left and completes quarter circle of 60 m. radius. The mass of the rotary engine and propeller of the plane amounts to 450 Kg with radius of gyration of 0.320 m. The engine speed is 2000 r.p.m. clockwise when viewed from the rear. Determine the gyroscopic couple on air craft and state its effect. In what way is the effect changed when i) the aero plane turns towards right , ii) the engine rotates clockwise when viewed from the front (nose end) and the aero plane turns a) left b) right ? **07**

Q.5 **(a)** Define natural frequency of vibration and obtain equation of natural frequency for spring mass system **07**

(b) Two parallel shafts whose centre lines are 5.2 m. apart are connected by open belt drive. The diameter of larger pulley is 1.5 m. and that of smaller pulley is 1 m. The initial tension in the belt when stationary is 3500 N .The mass of belt is 1.3 Kg/m length. The co-efficient of friction is 0.27 , Taking centrifugal tension into account , Calculate the power transmitted when the smaller pulley rotates at 350 r.p.m. **07**

OR

Q.5 **(a)** Find the natural frequency of compound pendulum. **07**

(b) Differentiate between belt drive and gear drive .State the advantages of epicyclic gear train. **07**

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