Unit - V

a) Discuss the working of a gyroscope work.

b) State gyroscope couple.

c) Sketch gyroscopic couple on naval ships.

d) Explain rigid disc at an angle fixed to a rotating shaft.

OR

The total mass of a 4-wheeled trolley car is 1800kg. The car runs on rails of 1.6m gauge and rounds a curve of 24m radius at 36km/hr. The track is banked at 10°. The external diameter of the wheel is 600mm and each pair with axle has a mass of 180kg with a radius of gyration of 240mm. The height of the centre of mass of the car above the wheel base is 950mm. Determine the pressure on each rail allowing for centrifugal force and gyroscopic couple actions.

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Total No. of Questions :5] *[Total No. of Printed Pages :4*

Roll No .....

AU/IP/IEM/PR/ME-403

B.E. IV Semester

Examination, June 2016

Theory of Machines and Mechanisms

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each questions are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

v) Assume suitable data, if missing.

Unit - I

1. a) What are the kinematic pairs?

b) Define Inversion of a mechanism.

c) Describe a pantograph with sketch.

d) Explain Davis and Ackerman's steering mechanisms with neat sketches.

OR

Find the degree of freedom of following of any four:

i) Oldham coupling

ii) Folding iron board

iii) Stephan coupling

iv) Folding beach chair

v) Knee joint

vi) Knuckle joint

Unit - II

2. a) Define Coriolis component.

   b) What is the application of Euler-Savary equation?

   c) Derive Kennedy Theorem.

   d) The crank of an engine 200mm long and connecting rod length to crank radius is 4. The crank has turned through 45° from inner dead centre position. The instantaneous speed of rotation of the crank is 240 rpm clockwise and it is increasing at the rate of 100 rad/s^2. Determine :

      i) Acceleration of the mid-point of connecting rod,

      ii) Angular acceleration of connecting rod, and

      iii) Acceleration of slider.

OR

ABCD is a four bar chain with link AD fixed. The lengths of the links are AB = 62.5mm; BC = 175mm; CD = 112.5mm; and AD = 200mm. The crank AB rotates at 10 rad/s clockwise. Draw the velocity and acceleration diagram when angle BAD = 60° and B and C lie on the same side of AD. Find the angular velocity and angular acceleration of links BC and CD.

Unit - III

3. a) What is conjugate action in Gears?

   b) Sketch nomenclature of a gear.

   c) How to cycloidal tooth profile?

   d) A Pair of gears giving 40 and 20 teeth respectively, are rotating in mesh the speed of smaller being 2000 rpm. Determine the velocity of sliding between the gear teeth faces at the point of engagement, at the pitch, point and at the point of disengagement if the smaller gear is the driver. Assume that the gear are 20° involutes from, addendum length is 5mm and there module is 5mm. Also find angle through which the pinion turns while any pairs of teeth are in contact

OR

Derive an equation for calculating path of contact between two gears,

Unit - IV

4. a) Sketch the terminology of a cam and follower mechanism.

   b) Classify the cams with sketches.

   c) Classify the followers with sketches.

   d) Draw the profile of a cam that gives a lift of 40mm to a rod carrying a 20mm diameter roller. The axis of the roller passes through the centre of the cam. The least radius of the cam is 50mm. The rod is to be lifted with simple harmonic motion in a quarter revolution and is to be dropped suddenly at half revolution. Determine the maximum velocity and maximum acceleration during the lifting. The cam rotates at 60rpm.

OR

Draw the displacement, velocity and acceleration diagram for the follower when it moves with simple harmonic motion. Derive the expression for the velocity and acceleration during out stroke and return stroke of the follower.