

OR

Explain the epicyclic gear trains solving method.

5. a) What is the function of a gyroscope?
- b) Derive the equation for the gyroscopic couple.
- c) How motorised gyroscope experiment is performed in the lab.
- d) Explain the gyroscopic effect in a naval ship.

OR

A four wheel trolley car weighs 30kN. Each axle with its two wheels and gears has a total mass moment of inertia of 35kg-m^2 . Each wheel is 500mm radius the centre distance between two wheels on an axle is 1.4m. Each axle is driven by a motor with a speed ratio of 1:3. Each motor along with its gear has a mass moment of inertia of 15kg m^2 and rotates in the opposite direction to that of axle. The centre of gravity of the car is located at 1m above the rails. Determine the limiting speed of the car while negotiating a curve of 200m radius without the wheels leaving the rails.

Roll No

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Examination, June 2014

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 question 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.
1. a) What is the kinematic pair?
 - b) Define degree of freedom.
 - c) Explain Grubler's criterion of mechanism.
 - d) Explain all inversion of four bar mechanism.

OR

Explain Davis and Ackermann's steering mechanisms.

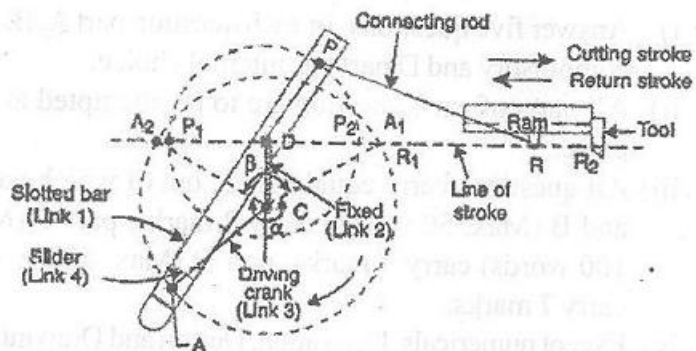
2. a) Define Cartesian vector notations.
- b) What is the rigid body.
- c) Explain Kennedy's theorem.
- d) Explain the relative velocity method.

OR

Figure 1 shows a Whitworth quick return motion mechanism. The various dimensions in the mechanism are as follows:

CD = 100mm; CA = 150mm, DP = 150mm; PR = 500mm;
The crank CA makes an angle of 60° with the vertical and rotates at 120 rpm in the clockwise direction.

Locate all the instantaneous centers and find the velocity of ram R.



Whitworth quick return mechanism of shaper

3. a) Classify the gears with example.
- b) What is difference between involutes and cycloidal tooth profile?
- c) Explain the bevel and worm gear with sketches.
- d) What are the properties of tooth profile for spur gear?

OR

A drive on a machine tool is to be made by two spiral gear wheels, the spirals of which are of the same hand and has normal pitch of 12.5mm. the wheels are of equal diameter and the centre if distance between the axes of the shafts is approximately 134mm. The angle between the shafts is 80° and the speed ratio 1.25.

Determine.

- i) The spiral angle of each wheel
- ii) The number of teeth on each wheel
- iii) The efficiency of the drive, if the friction angle is 6° and
- iv) The maximum efficiency

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4. a) Write the function of a cam and follower mechanism.
- b) Sketch the various types of followers.
- c) Explain the nomenclature of a typical cam profile.
- d) A cam rotating clockwise at a uniform speed of 1000rpm is required to give a roller follower the motion defined below:
 - i) Follower to move outwards through 50mm during 120° of cam rotation.
 - ii) Follower to dwell for next 60° of cam rotation.
 - iii) Follower to return to its starting position during next 90° of cam rotation.
 - iv) Follower to dwell for the rest of the cam rotation.

The minimum radius of the cam is 50mm and the diameter of the roller is 10mm. the line of stroke of the follower is off-set by 20mm from the axis of the cam shaft. If the displacement of the follower takes place with uniform and equal acceleration and retardation on both the outward and return strokes, draw profile of the cam and find the maximum velocity and acceleration during out stroke and return stroke.

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