Student Exam No. _____

GANPAT UNIVERSITY
B. Tech. Semester: III Mechatronics Engineering
Regular Examination November – December 2013
2MC304 - Kinematics

Time: 3 Hours   Total Marks: 70

Instructions: 1 Attempt all questions.
2 Assume suitable data if required.
3 Right figures indicate full marks.
4 Scientific calculators are allowed.

Section – I

Que. – 1 (A) Give classification of kinematic pair.   04

(B) What is kinematic chain? Write equation to find whether links form kinematic   04
pair or not.

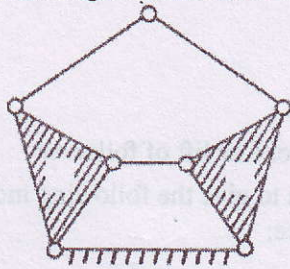(C) Find degree of freedom for following mechanisms as shown in Fig 1 & 2:   04
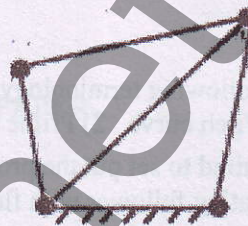

Fig:1   Fig:2

OR

Que. – 1 (A) What is inversion of mechanism? List inversion of single slider crank and   04
explain any one with sketch.

(B) Define following terms :   04
1) Incompletely constrained motion   3) Kinematic pair
2) Rigid link   4) Rolling pair

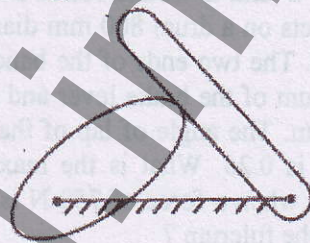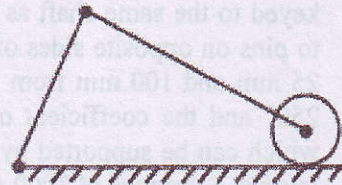(C) Find degree of freedom for following mechanisms as shown in Fig 1 & 2 :   04

Fig:1   Fig:2

Que. – 2 (A) What is the condition for correct steering? Sketch and explain any one type of   06
Steering gear mechanism with its advantages.

(B) Explain pantograph mechanism with neat sketch   05

OR

Que. – 2 (A) Explain the following :   06
1) Rubbing Velocity 2) Instantaneous center 3) Kennedy's theorem

(B) What is straight line motion mechanism? Explain hart's mechanism with   05
sketch.

Que. – 3 (A) Derive the expression for the frictional torque of a flat collar bearing Assuming (i) Uniform pressure theory (ii) Uniform wear theory. **06**

(B) A conical pivot bearing supports a vertical shaft of 300 mm diameter. It is subjected to a load of 30 kN. The angle of the cone is 120^0 and the co-efficient of friction is 0.03. Find the power lost in friction when speed is 100 rpm, assuming 1) uniform pressure and 2) uniform wear condition. **06**

Section – II

Que. – 4 (A) Explain types of cams with sketch. **03**

(B) Cam with 30 mm as radius is rotating clockwise and has to give the motion to the follower 10 mm radius as given below: **09**
1) Follower to complete outward stroke of 25 mm during 120^0 of cam rotation with uniform acceleration and retardation.
2) Follower to dwell for 60^0 of cam rotation.
3) Follower to return to its initial position during 90^0 of cam rotation with uniform acceleration and retardation.
4) Follower to dwell for remaining 90^0 of cam rotation.
Layout the cam profile when the roller follower axis passes through the axis of the cam.

OR

Que. – 4 (A) Define following terminology : **03**
1) Pitch curve 2) Prime circle 3) Stroke or lift of follower

(B) It is required to set out the profile of a cam to give the following motion to the reciprocating follower with flat contact face: **09**

1) Follower to have a stroke of 30 mm during 120^0 of cam rotation.
2) Follower to dwell for 30^0 of cam rotation.
3) Follower to return to its initial position during 120^0 of cam rotation.
4) Follower to dwell for remaining 90^0 of cam rotation.
The minimum radius of cam = 25 mm. Outstroke and return stroke of the follower are performed with simple harmonic motion.
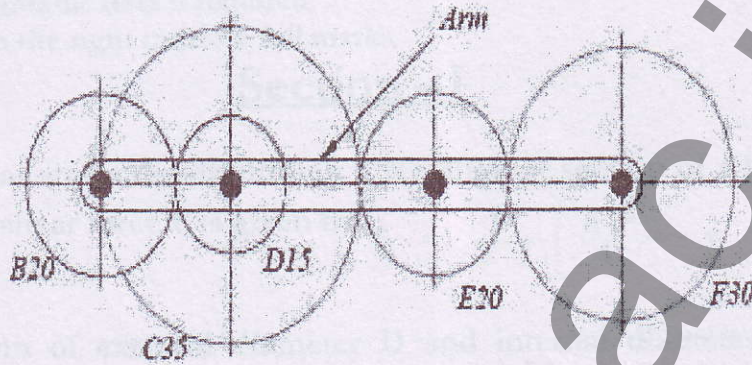
Que. – 5 (A) Derive an equation of braking torque for single block brake. **05**

(B) In a winch, the rope supports a load W and is wound round a barrel 450 mm diameter. A differential band brake acts on a drum 800 mm diameter which is keyed to the same shaft as the barrel. The two ends of the bands are attached to pins on opposite sides of the fulcrum of the brake lever and at distances of 25 mm and 100 mm from the fulcrum. The angle of lap of the brake band is 250° and the coefficient of friction is 0.25. What is the maximum load W which can be supported by the brake when a force of 750 N is applied to the lever at a distance of 3000 mm from the fulcrum ? **06**

OR

Que. – 5 (A) What is dynamometer? Give classification of dynamometer and explain any one with neat sketch. **05**

(B) A simple band brake is applied to a rotating drum of 500 mm diameter. The angle of lap of the band on the drum is 260°. One end of the band is attached to a fulcrum pin of the lever and other end is to a pin 100 mm from the fulcrum. If coefficient of friction is 0.25, and a braking force of 100 N is applied at a distance of 750 mm from the fulcrum, determine the braking torque when the drum rotates in anti clock wise direction. **06**

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Que. – 6   (A)   Explain reverted gear train.   **03**

(B)   The fig shows an Epicyclic gear train. Wheel E is fixed and wheels C and D   **09**
are integrally cast and mounted on the same pin. If arm makes one revolution
per sec (Counterclockwise) determine the speed and direction of rotation of
the wheels B and F.

END OF PAPER