Seat No: - _____

Ganpat University
B. Tech. Sem. III Mechanical Engineering
CBCS Regular Examination Nov/Dec – 2013
2ME304 Kinematics of Machines

[Time: 3 Hour] [Total marks: 70]

Instructions:
(1) Attempt all questions.
(2) Figure to the **right** indicate full marks.
(3) Assume suitable data if necessary.
(4) Only scientific calculator is allowed.
(5) Draw neat sketch wherever essential.

SECTION-I

Que.1

(A) Differentiate: [4]
(i) Lower pair and higher pair
(ii) Kinematics and dynamics

(B) Explain completely constrained motion, incompletely constrained motion and successfully constrained motion with proper sketches. [4]

(C) For the kinematic linkages shown in **fig.-1**, find the number of binary links, ternary links, other links, total links, loops, joints or pairs and degree of freedom. [4]

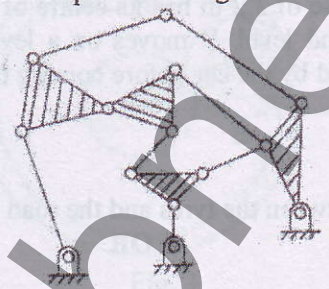

Fig. 1

OR

Que.1

(A) Define following terms. [4]
(i) Mechanism (ii) Inversions (iii) Link (iv) Structure

(B) What is degree of freedom? State and derive Grubler's criterion for constrained motion of a plane mechanism with lower pairs. [4]

(C) Explain rigid and resistant body. Also define links and explain different types of links with neat sketch. [4]

Que.2

(A) What is pantograph? Show that it can produce paths exactly similar to ones traced out by a point on a link on an enlarged or a reduced scale. [4]

(B) What is an automobile steering gear mechanism? What are its types? Which steering gear mechanism is preferred and why? [4]

(C) Enlist inversions of double slider crack chain mechanism with examples. Explain elliptical trammel with neat sketch. [4]

OR

Que.2

(A) State and explain Kennedy's theorem as applicable to Instantaneous centres of rotation of three bodies. How is it helpful in locating various instantaneous centres of a mechanism? [3]

(B) Explain different types of Instantaneous centres. [3]

(C) The crank and connecting rod of a theoretical steam engine are 0.5 m and 2 m long respectively. The crank makes 180 rpm in the clockwise direction. When it has turned 45° from the inner dead centre position, determine: [6]

(i) Velocity of piston,
(ii) Angular velocity of connecting rod
(iii) Velocity of point E on the connecting rod 1.5 m from the gudgeon pin.

Que.3

(A) How are cams classified? Describe in details. [3]

(B) Use the following data to draw the profile of a cam in which a knife edged follower is raised with uniform acceleration and deceleration and is lowered with simple harmonic motion: [8]

Least radius of cam = 60 mm
Lift of follower = 45 mm
Angle of ascent = 60°
Angle of dwell between ascent and descent = 40°
Angle of descent = 75°

SECTION – II

Que.4

(A) What is a brake? What is the difference between brake and clutch? [2]

(B) Describe working of a band and block brake with help of a neat sketch. Derive the equation for ratio of tight and slack side tensions. [5]

(C) A vehicle having a wheel base of 3.2 m has its centre of mass at .4 m from the rear wheels and 550 mm from the ground level. It moves on a level ground at a speed of 54 km/h. Determine the distance moved by the car before coming to rest on applying the brakes to the [5]

(i) rear wheels
(ii) front wheels
(iii) all the four wheels

The coefficient of friction between the tyres and the road is 0.5.

OR

Que.4

(A) What is dynamometer? How they are classified? [2]

(B) Explain working of belt transmission dynamometer with neat sketch. [4]

(C) A single block brake as shown in fig. 2 has a brake drum diameter of 1 m and the angle of contact is 30°. It takes 280 Nm torque at 300 rpm. The coefficient of friction is 0.35. determine the required force P to be applied when the rotation of drum is [6]

(i) Clockwise (ii) Anticlockwise

Also find the value of a fulcrum distance 'a' from tangential braking force for self locking.

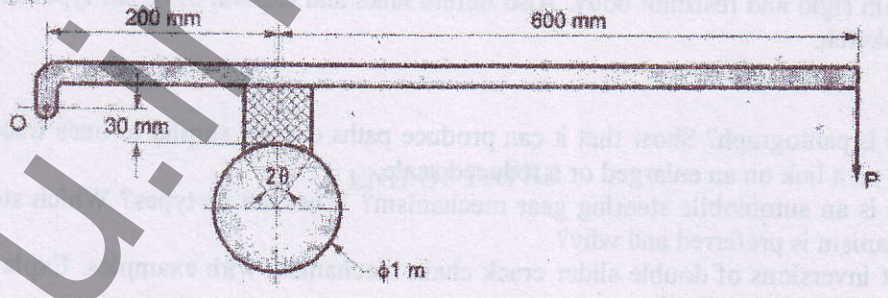

Fig. 2

Que.5

(A) Define the terms: [2]

(i) Coefficient of friction (ii) Limiting angle of friction

(B) Deduce an expression for the efficiency of an inclined plane when a body moves up a plane. [5]

(C) A conical pivot supports a load of 20 kN. The intensity of pressure is 0.5 MN/m^2. Find the diameter of the bearing surface and its cone angle if the face width is 0.75 times its diameter. If the friction coefficient is 0.06 and the shaft runs at 120 rpm, find the power lost in friction. [5]

OR

Que.5

(A) What is friction? Is it a blessing or curse? Justify your answer giving examples. [2]

(B) Derive expression for the friction torque considering uniform wear for a collar bearing. [5]

(C) An effort of 1500 N is required to just move a body up an inclined plane of angle 12°, force acting parallel to the plane. If the angle of inclination is increased to 15°, then the effort required is 1720 N. Find the weight of the body and the coefficient of friction. [5]

Que.6

(A) What do you understand by gear train? Discuss various types of gear trains. [6]

(B) **Fig. 3** shows an epicyclic gear train. Pinion A has 15 teeth and is rigidly fixed to motor shaft. The wheel B has 20 teeth and gears with A and also with annular fixed wheel E. Pinion C has 15 teeth is integral with B (B-C are compound gear). Gear C meshes with annular wheel D, which is keyed to machine shaft. The arm rotates about the same shaft on which A is fixed and carries the compound wheel B, C. If the motor runs at 1000 rpm, find the speed of machine shaft. [5]

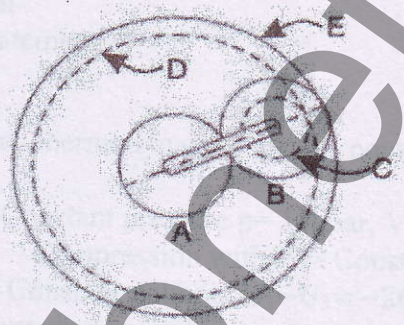

Fig. 3

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