4E4140

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B.Tech. IV Semester (Main/Back) Examination May - 2018
Mechanical Engg.
4ME1A Kinematics of Machines
AE,ME

Time : 3 Hours **Maximum Marks : 80**
Min Passing Marks : 26

*Attempt any **five** questions, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Unit - I

1. a) What do you mean by kinematic link and pair? Classify and explain various kinematic pairs. ***(8)***

   b) Differentiate between kinematic chain and mechanism. Give inversions of four bar chain taking at least two examples. ***(8)***

OR

1. a) Describe in detail the instantaneous centre method of determining velocity of a point on a link. **(8)**

   b) In the mechanism as shown in fig. 1 the slider C is moving to the right with velocity of 1m/s and acceleration of 2.5 m/s^2. The dimensions of various links are AB = 3m inclined at 45° with the vertical and BC = 1.5 m inclined at 45° with the horizontal. Determine the magnitude of vertical and horizontal component of the acceleration of the point B and the angular acceleration of the links AB and BC. **(8)**

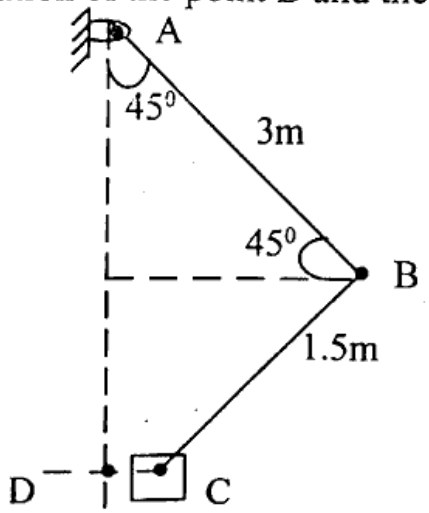

Fig. 1

Unit - II

2. a) Explain Tchbelcheff and scott - Russel mechanisms. **(8)**

   b) Construct and describe any two indicator mechanisms. **(8)**

OR

2. a) Explain the construction and working of Ackerman and Davis steering mechanisms. **(8)**

   b) The angle between the axes of two shafts connected by Hooke's joint is 18^{o}. Determine the angle turned through by the driving shaft when the velocity ratio is maximum and unity. **(8)**

Unit - III

3. Derive expressions for length of belt in the 16 cases of open belt drive and cross belt drive. **(16)**

OR

3. a) Differentiate between static, dynamic and rolling friction. What is angle of repose? What is limiting angle of friction. **(8)**

   b) The pitch of 50 mm mean diameter threaded screw of a screw jack is 12.5 mm. The coefficient of friction between the screw and the nut is 0.13. Determine the torque required on the screw to raise a load of 25 kN, assuming the load to rotate with the screw. Determine the ratio of the torque required to raise the load to the torque required to lower the load and also the efficiency of the machine. **(8)**

Unit - IV

4. a) Classify various type of brakes and clutches used in automobiles. **(8)**

   b) A single dry plate clutch transmits 7.5 kW at 900 r.p.m. The axial pressure is limited to 0.07 N/mm^2. If the coefficient of friction is 0.25, find mean radius and face width of the friction lining assuming the ratio of the mean radius to the face width as 4 and outer and inner radii of the clutch plate may be assumed suitably as required. **(8)**

OR

4. What do you mean by dynamometer? Explain construction and working of any two dynamometers. **(16)**

Unit - V

5. Prepare a detailed note on construction, working principle and application suitability of various types of cams. **(16)**

OR

5. a) Derive expressions for maximum velocity and acceleration of the follower of a cam on return stroke in case when the follower moves with simple Harmonic motion. **(8)**

   b) Draw a cam profile to drive an oscillating roller follower to the specifications given below.

      a) Follower to move outward through an angular displacement of 20° during the first 120° rotation of the cam,

      b) Follower to return to its initial position during next 120° of cam rotation.

      c) Follower to dwell during the next 120° of cam rotation.

      The distance between pivot centre and roller centre = 120 mm, distance between pivot centre and cam axis = 130 mm, minimum radius of cam = 40 mm, radius of roller = 10 mm, inward and outward strokes take place with simple Harmonic motion. **(8)**
