

4E4140

Roll No. _____

Total No of Pages: 4

4E4140

B. Tech. IV Sem. (Main/Back) Exam., June/July-2014

Mechanical Engg.

4ME1A Kinematics of Machines

Common with AE

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks: 24

Instructions to Candidates:-

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.

Use of following supporting material is permitted during examination.

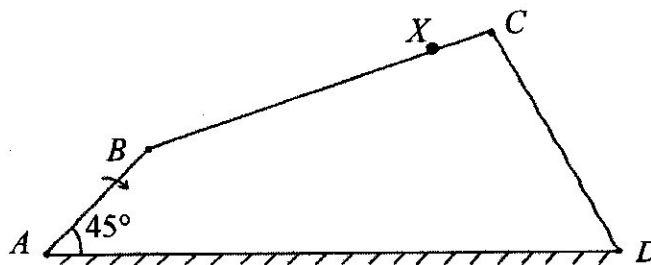
(Mentioned in form No.205)

1. _____

2. _____

UNIT-I

- Q.1. (a) Present a classification of kinematic pairs. [4]
(b) Draw and describe Oldham coupling. [4]
(c) Determine velocity of point 'x' on following four bar chain, when crank AB rotates at 600 rpm clockwise. [8]



$$AB = 4cm$$

$$BC = 7cm$$

$$CD = 5cm$$

$$DA = 12cm$$

$$CX = 2cm$$

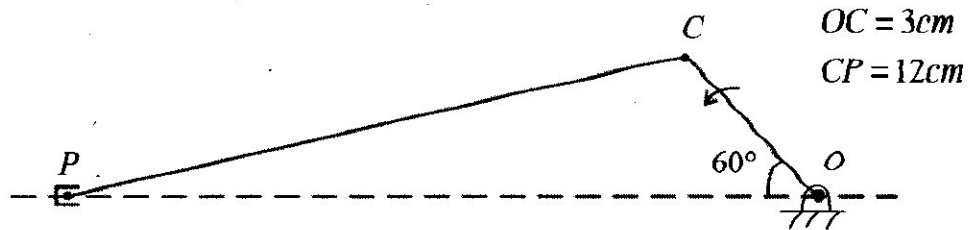
[4E4140]

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[15300]

OR

- Q.1. (a) Derive an expression for coriolis acceleration and explain its direction. [8]
(b) Locate Instantaneous centers and determine velocity of slider for following arrangement. Crank OC rotates at 300 rpm anticlockwise. [8]



UNIT-II

- Q.2. (a) With help of a neat sketch, explain working principle of Scott Russel mechanism. [8]
(b) Describe Hooke's joint and derive an expression for angular velocity ratio of driver and driven shaft. [8]

OR

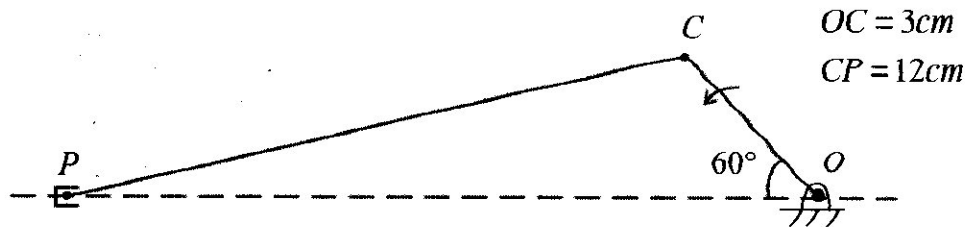
- Q.2. (a) What is condition for correct steering? Discuss Ackerman steering mechanism with help of a neat sketch. [8]
(b) Derive an expression for time period of Trifler Suspension. [8]

UNIT III

- Q.3. (a) A thrust bearing has contact surface 200 mm external diameter and 150 mm internal diameter. The coefficient of friction is 0.08, the total axial load is 3000 N and maximum uniform intensity of pressure is 0.35N/mm^2 . Calculate the number of collars required and the power lost in friction at 420 rpm. [8]
(b) Derive an expression for moving a body up on inclined plane. [8]

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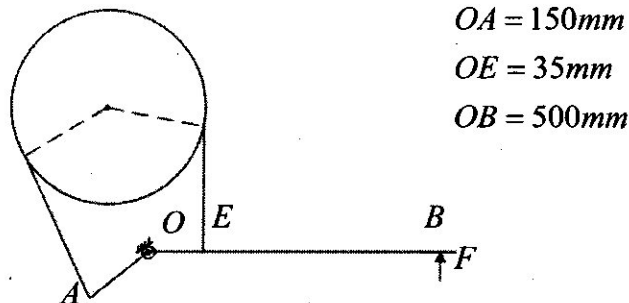
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OR

- Q.3 (a) A flat belt of $200 \times 12 \text{ mm}^2$ cross section runs between two pulleys. The allowance strength of belt material is 2.5 N/mm^2 . Determine the maximum power that can be transmitted by it if the ratio of tension is 2 and the density of the material of the belt is 1000 kg/m^3 . [8]
- (b) What is the effect of centrifugal tension on power transmission capacity of a belt? [4]
- (c) Discuss chordal action in a chain drive. [4]

UNIT-IV

- Q.4. (a) Derive a formula for ratio of tensions $\left(\frac{T_1}{T_2}\right)$ in a Band and Block brake. (8)
- (b) A band brake as shown in figure has an angle of contact 225° and is required to sustain a torque of 350 N-m . The diameter of drum is 350 mm and coefficient of friction is 0.3 . Determine the effort F . For what value of OE the brake is self locking. [8]



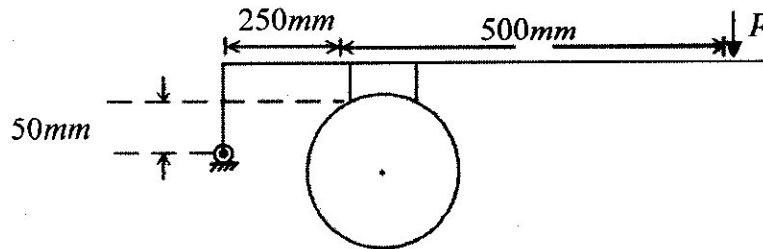
OR

- Q.4. (a) Draw and describe belt transmission dynamometer. [8]

- (b) For a block as shown in figure, the diameter of brake drum is 400 mm and angle of contact is 40° . The applied effort F is 2 kN and coefficient of friction is 0.35. Determine braking torque when drum is rotating.

(i) clockwise and (ii) anticlockwise

[8]



UNIT-V

- Q.5. (a) Describe pressure angle of a cam. Discuss its importance in cam design. [4]

- (b) A cam drives a knife edge follower. During first 90° of rotation the follower moves outward through a distance 30 mm with SHM. The follower dwells for next 90° of rotation. During next 90° the follower moves inward with SHM and then dwells for remaining 90° of cam rotation. Draw cam profile, if base circle radius is 30 mm. [12]

OR

- Q.5. Draw profile of a cam driving a roller follower. For first 120° of cam rotation follower moves upward through a distance of 40 mm with uniform acceleration and then dwells for next 120° . In the last part of cam rotation follower returns to initial position with SHM. Give that base circle radius is 40 mm, draw the cam profile. [16]
