

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.

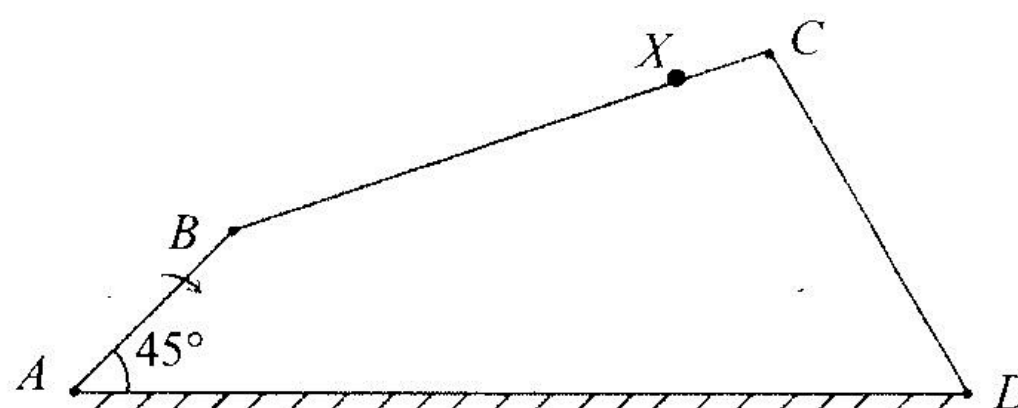
(Mentioned in form No.205)

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]



$$AB = 4cm$$

$$BC = 7cm$$

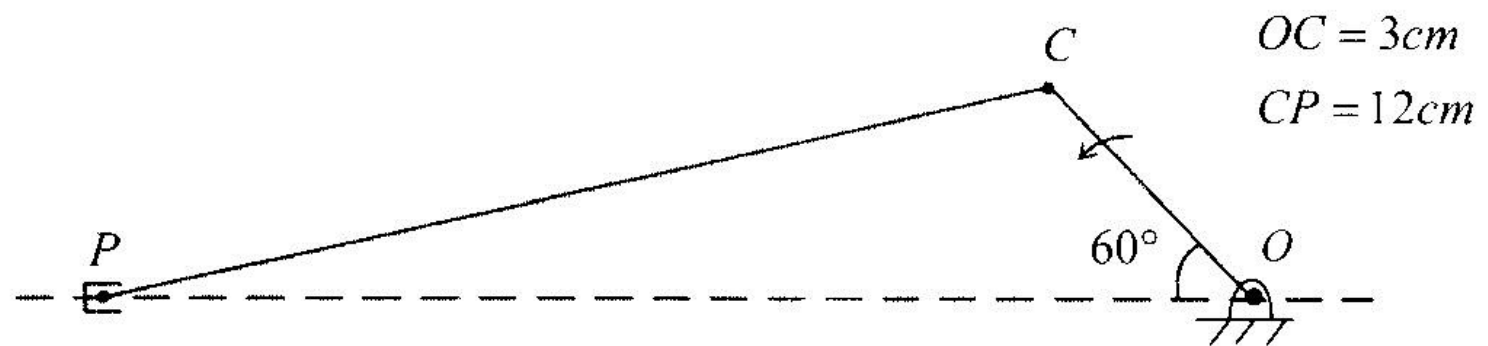
$$CD = 5cm$$

$$DA = 12cm$$

$$CX = 2cm$$

**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**

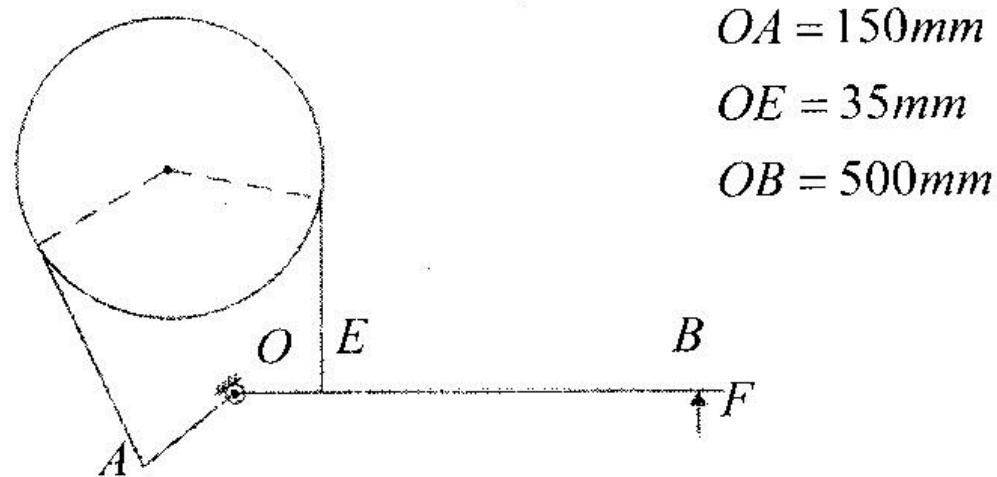
- Q.3. (a) A thrust bearing has contact surface 200 mm external diameter and 150 mm internal diameter. The coefficient of friction is 0.08, the total axial load is 3000 N and maximum uniform intensity of pressure is  $0.35\text{N/mm}^2$ . Calculate the number of collars required and the power lost in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

**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  $2.5 \text{ N/mm}^2$ . 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  $1000 \text{ kg/m}^3$ . [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  $\left(\frac{T_n}{T_o}\right)$  in a Band and Block brake. (8)
- (b) A band brake as shown in figure has an angle of contact  $225^\circ$  and is required to sustain a torque of  $350 \text{ N-m}$ . The diameter of drum is  $350 \text{ mm}$  and coefficient of friction is  $0.3$ . Determine the effort  $F$ . For what value of  $OE$  the brake is self locking. [8]



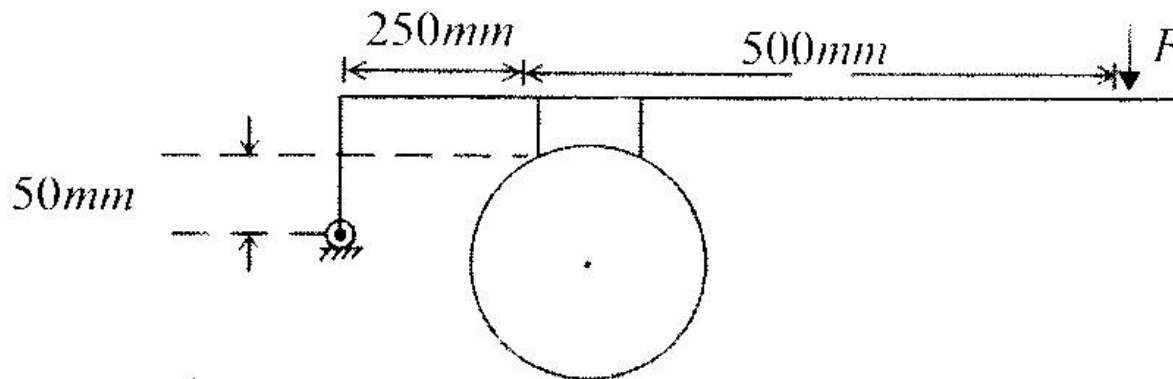
**OR**

- 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  $40^\circ$ . 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  $90^\circ$  of rotation the follower moves outward through a distance 30 mm with SHM. The follower dwells for next  $90^\circ$  of rotation. During next  $90^\circ$  the follower moves inward with SHM and then dwells for remaining  $90^\circ$  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  $120^\circ$  of cam rotation follower moves upward through a distance of 40 mm with uniform acceleration and then dwells for next  $120^\circ$ . 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]

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