



# CAMBRIDGE INSTITUTE OF TECHNOLOGY

K.R. PURAM, BENGALURU-560036.

## Department of Basic Sciences

### Preparatory Examination - Odd Semester 2018-19

Sub. Name: Elements of Civil Engineering & Engineering Mechanics

Sub. Code: 18CIV14

Semester: I

Date: 14-01-2019

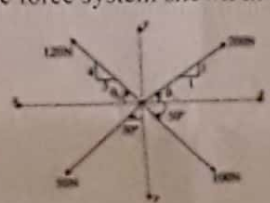
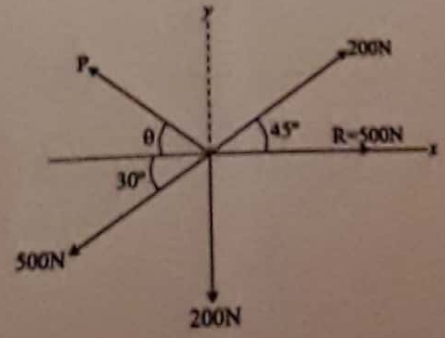
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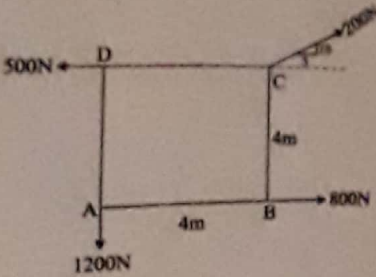
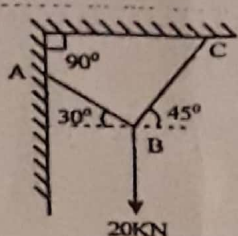
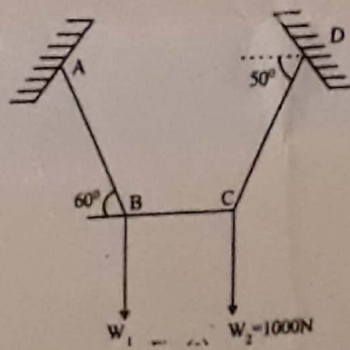
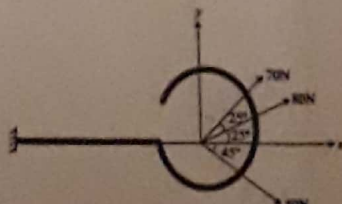
Duration: 3 Hours

Max. Marks: 100

#### NOTE:

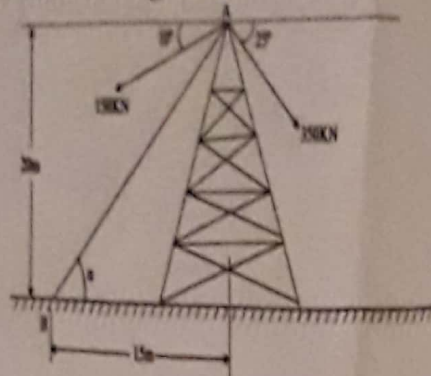
Answer five full questions, choosing one from each module, each full question carries maximum of 20 Marks.

Sl. No.	QUESTIONS	COs	RBT Levels	Marks
1	<b>Module - I</b>			
	a) Define Resolution and Composition of forces.	CO1	L1	04M
	b) Explain the principles of engineering mechanics with the help of neat sketch.	CO1	L2	07M
	c) Interpret the resultant for the force system shown in the figure below	CO1	L3	09M
				
	OR			
2	a) List the characteristics of couple.	CO1	L1	04M
	b) Four forces acting on a point shown in figure below such that resultant of all the four forces 500N acting along the x axis. Determine the unknown force P and its inclination.	CO1	L2	07M
				

	<p>c) Interpret the resultant, magnitude, direction and position from point A of the forces shown in the figure below.</p> 	CO1	L3	09M
3	<p style="text-align: center;"><b>Module - II</b></p> <p>a) List the condition of equilibrium.</p> <p>b) Two cables are connected at A and C as shown in figure below and a force of 20kN is applied at B. Determine the forces in the cable along BA and CB.</p>  <p>c) Interpret the value of <math>W_1</math> for the equilibrium of the system shown in the figure below.</p>  <p style="text-align: center;">OR</p>	CO2	L1	04M
		CO2	L2	07M
		CO2	L3	09M
4	<p>a) Define structural Engineering.</p> <p>b) Determine the resultant of the three forces acting on a hook shown in figure below.</p> 	CO2	L1	04M
		CO2	L2	07M



- c) Two cables attached at the top of tower carries a gay cables AB. Interpret the tension in gay cable such that the resultant of the forces in all three cables acts vertically down as shown in figure below.



CO2

L3

09M

### Module - III

- 5 a) A body resting on a horizontal plane required a pull of 100 N inclined at  $30^\circ$  to horizontal just to move it. It was also found that a push of 110 N inclined at  $20^\circ$  to the plane just moved the body. Determine the weight of body and coefficient of friction.

CO3

L2

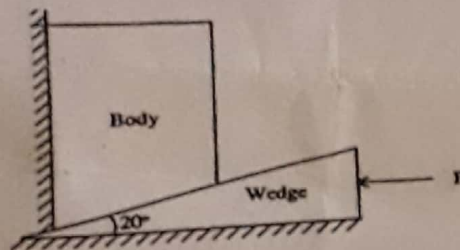
10M

- b) A block weighing 10 kN is to be raised by means of  $20^\circ$  wedge as shown below. Determine the horizontal force which will just raise the block if coefficient of friction for all contact surfaces is 0.3.

CO3

L3

10M



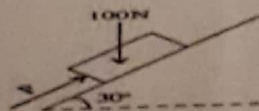
OR

- 6 a) Determine the value of P so that the body will not impend down the plane. Also find the value of P for the body to impend up the plane. Take coefficient of friction is 0.3.

CO3

L2

10M

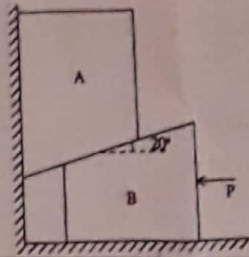


- b) Determine the force P that must be applied to the 20 kN block B to lift the 100 kN block A shown in figure below. The coefficient of friction for all contact surfaces is 0.3.

CO3

L3

10M



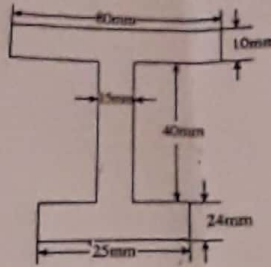
#### Module - IV

- 7 Derive the expression of quarter-circle by the first principle.

CO4 L2 10M

Determine the centroid of I-section with respect to given figure.

CO4 L3 10M

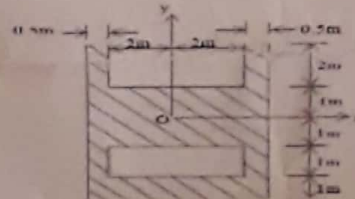


OR

- 8 a) Determine the Moment of Inertia of Circle by the method of first principle.  
b) Determine the Moment of Inertia and polar radius of gyration with respect to given figure.

CO4 L2 10M

CO4 L3 10M



#### Module - IV

- 9 a) With the help of neat sketch explain Range and obtain the expression for range of projectile.  
b) A projectile is fired from the top of cliff 150 m height with an initial velocity of 180 m/sec at an angle of elevation of  $30^\circ$  with the horizontal. Neglecting air resistance, determine:  
i) greatest elevation above the cliff  
ii) horizontal distance from the gun to the point where the projectile strikes the ground.

CO5 L2 10M

CO5 L3 10M

OR

- 10 a) State and prove Newton's Laws of Motion.  
b) A horizontal bar of length 1.5 m rotates, it accelerates uniformly from 1200 rpm to 1500 rpm in an interval of 5 seconds. Find the linear velocity at the beginning and end of the interval. What are the normal and tangential components of the acceleration at the center of the bar after 4 seconds?

CO5 L2 10M

CO5 L3 10M

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