Printed Page:- **Subject Code**:- **AME0303**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - THEORY EXAMINATION (20 .... - 20.....)

Subject: Engineering Mechanics

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. Which of the following is a vector quantity? (CO1,K1) 1

(a) Energy
(b) Mass
(c) Momentum
(d) angle

1-b. Two non-collinear parallel equal forces acting in opposite direction. (CO1,K1) 1

(a) balance each other
(b) constitute a moment
(c) constitute a couple
(d) constitute a moment of couple

1-c. Who gave the concept of Dry friction? (CO2,K1) 1

(a) C.A. Coulomb
(b) GA. Coulomb
(c) C.P Coulomb
(d) Albert Einstein

1-d. At what conditions the dry friction occurs between the surfaces in contact? (CO2,K1) 1

(a) When there is no lubricating fluid
(b) When there is no friction fluid

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(c) When there is no adhesive fluid

(d) When there is no cohesive fluid

1-e. In determining stresses in frames by methods of sections, the frame is divided into two parts by an imaginary section drawn in such a way as not to cut more than (CO3,K1) 1

(a) two members with unknown forces of the frame

(b) three members with unknown forces of the frame

(c) four members with unknown forces of the frame

(d) three members with known forces of the frame

1-f. Non-coplanar non-concurrent forces are those forces which (CO3,K1) 1

(a) Meet at one point, but their lines of action do not lie on the same plane

(b) Do not meet at one point and their lines of action do not lie on the same plan

(c) Do not meet at one point but their lines of action lie on the same plane

(d) None of the above

1-g. The point through which the whole weight of the body acts is called (CO4,K1) 1

(a) Inertial point

(b) Center of gravity

(c) Centroid

(d) Central point

1-h. The point at which the total area of a plane figure is assumed to be concentrated is called (CO4,K1) 1

(a) Centroid

(b) Centre of gravity

(c) Central point

(d) Inertial point

1-i. The relationship $s = ut + \frac{1}{2}at^2$ is applicable to bodies. (CO5,K1) 1

(a) Moving with any type of motion

(b) Moving with uniform velocity

(c) Moving with uniform acceleration

(d) Both (b) and (c)

1-j. If two bodies A and B are projected upwards such that the velocity of A is double the velocity of B, then the height to which the body A will rise will be the height to which the body B will rise (CO5,K2) 1

(a) two times

(b) four times

(c) eight times

(d) None of the above

2. Attempt all parts:-

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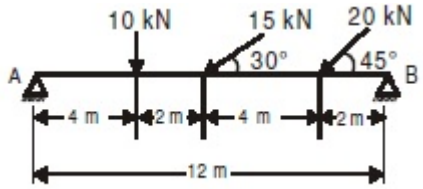
2.a.	What is meant by mechanics? (CO1,K1)	2
2.b.	Define friction.(CO2,K1)	2
2.c.	How the trusses are classified? (CO3,K2)	2
2.d.	What is difference between Centroid and center of gravity? (CO4,K2)	2
2.e.	Write down the equations of plane curvilinear motion of the rigid body. (CO5,K2)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Define a couple.(CO1,K1)	6
3-b.	State the conditions for the equilibrium of a two dimensional rigid body (CO1,K2)	6
3-c.	Derive the expression for the relationship between tight side and slack side forces in a belt friction problem. (CO2,K2)	6
3-d.	The velocity ratio of a machine is 150. It lifts loads of 240 N and 420 N with efforts of 5 N and 6.5 N respectively. Determine the efficiency of the machine when the load to be lifted is 300 N. (CO2,K3)	6
3.e.	The beam AB of span 12 m shown in Fig. is hinged at A and is on rollers at B. Determine the reactions at A and B for the loading shown in the Figure. (CO3,K3)	6



3.f.	Compare and contrast the Area moment of Inertia with mass moment of inertia.(CO4,K2)	6
3.g.	A train of weight 2000 kN starts from rest and attains a speed of 100 km/h in 4 minutes. If the frictional resistance of the track is 8 N per kN of the train's weight, find the average pull required. Take g = 9.8 m/s2.(CO5,K3)	6

SECTION-C 50

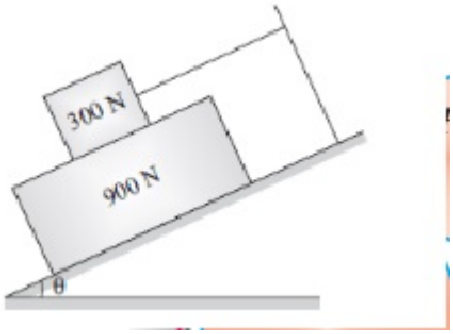
4. Answer any one of the following:-

4-a.	A particle is acted upon by the following forces: (i) A pull of 8 N due North East ; (ii) A pull of 10 N due North; (iii) A pull of 12 N due East; (iv) A pull of 4 N in a direction inclined 60° South of West; (v) A pull of 6 N in a direction inclined 30° East of South. Find graphically the magnitude and direction of the resultant force. (CO1,K3)	10
4-b.	Determine analytically the magnitude and direction of the resultant of the following four forces acting at a point : (i) 10 N pull N 30° E ; (ii) 12.5 N push S 45° W ; (iii) 5 N push N 60° W ; (iv) 15 N push S 60° E. (CO1,K3)	10

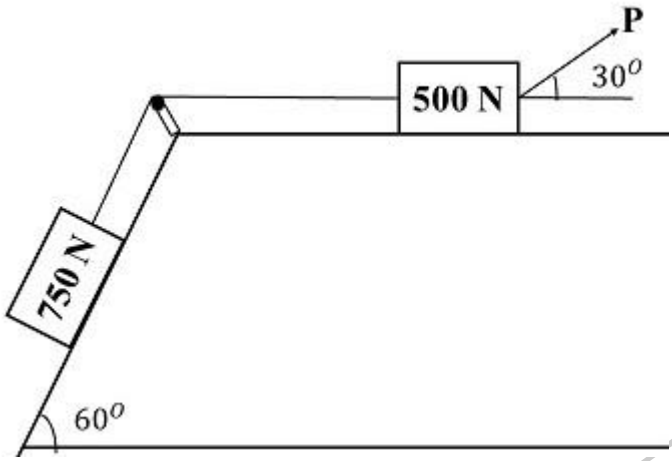
5. Answer any one of the following:-

5-a.	What should be the value of θ in Figure below which will make the motion of 900	10

N block down the plane to impend? The coefficient of friction for all contact surfaces is 1/3. (CO2,K3)

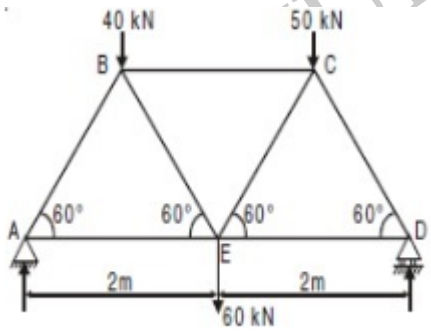


5-b. What will be the value of P in the system shown in Figure below to cause the motion to impend? Assume the pulley is smooth and the coefficient of friction between the other contact surfaces is 0.2. (CO2,K3) 10

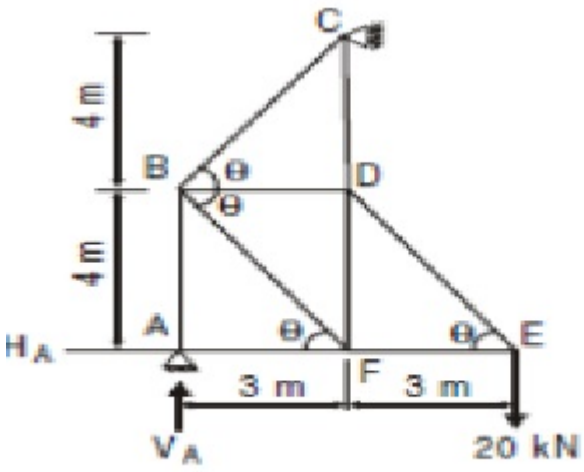


6. Answer any <u>one</u> of the following:-

6-a. Determine the forces in all the members of the trusses shown in figure below. Indicate the nature of forces using the convention tension as +ve and compression as –ve. (CO3,K3) 10

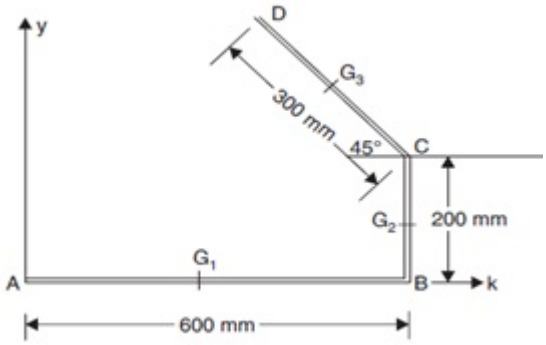


6-b. Determine the forces in all the members of the trusses shown in Figure below. Indicate the nature of forces using the convention tension as +ve and compression as –ve. (CO3,K3) 10



7. Answer any <u>one</u> of the following:-

7-a. Determine the centroid of the wire shown in figure. (CO4,K3) 10



7-b. Derive the mass moment of inertia of a circular disc. (CO4,K3) 10

8. Answer any <u>one</u> of the following:-

8-a. A particle is dropped from the top of a tower 100 m high. After one second another particle is projected upwards from the foot of the tower which meets the first particle at a height of 18m. Find the velocity with which the second particle was projected. (CO5,K3) 10

8-b. A bullet of weight 50 gm is fired into a body of weight 5 kg, which is suspended by a string 1 m long. Due to this impact, the 5 kg body swings through an angle of 30º from the vertical. Calculate the velocity of the bullet. (CO5,K3) 10

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