Register No: …………………   Name: ....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)
(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)
SECOND SEMESTER B.TECH. DEGREE EXAMINATION(R,S), MAY 2024
(Common for CE, CH, FT and ME)
(2020 SCHEME)

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Course Code	**:**	**20EST100**
Course Name	**:**	**Engineering Mechanics**
Max. Marks	**:**	**100** **Duration:3 Hours**

Scientific calculator and statistical table is allowed in the examination hall.

PART A
(Answer all questions. Each question carries 3 marks)

1. State and explain Varignon's theorem of moments.

2. Define system of forces and explain any two systems of forces.

3. With the help of sketches, explain how forces involved in the lifting of a load by a wedge are analysed.

4. Distinguish between angle of friction and angle of repose.

5. State parallel and perpendicular axis theorems.

6. Obtain an expression for the volume of the body generated by the revolution of a rectangular area. The side 'L' of the rectangle is in touch with the axis of rotation and the other side is of length 'r'.

7. Describe the impulse-momentum principle and its application in the study of the dynamics of objects moving along a linear path.

8. Differentiate kinetics and kinematics.

9. Define instantaneous centre of rotation.

10. A body moving with SHM has velocities of 12m/s and 6m/s at 2m and 4m distance from the mean position. Find the amplitude of the body.

PART B
(Answer one full question from each module, each question carries 14 marks)
MODULE I

11. For the following system of forces, find the magnitude and direction of the resultant force.   14
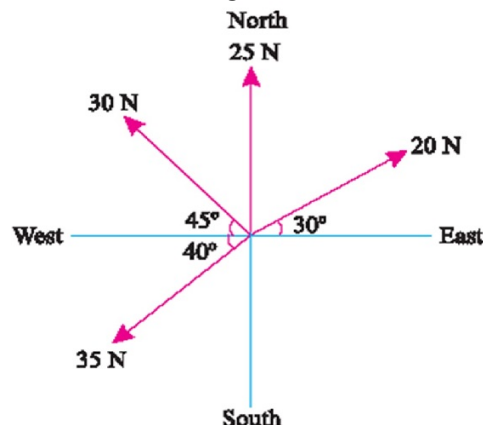
12.   A ball of weight 120 N rests in a right-angled groove, as in fig. The sides of the groove are   14
       inclined to an angle of 30º and 60º to the horizontal. If all the surfaces are smooth, then
       determine the reactions R_A and R_C at the points of contact.
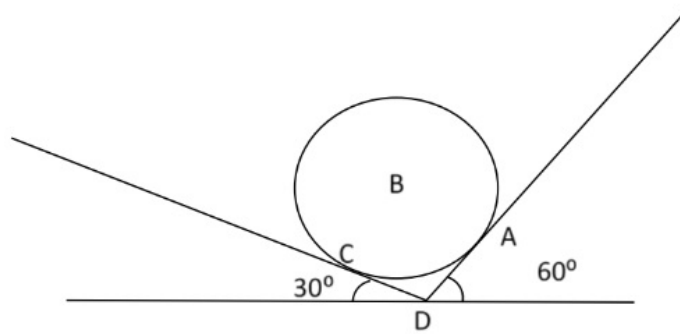
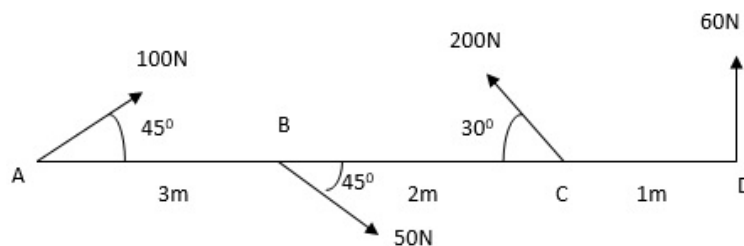**MODULE II**

13.   a. Describe the different types of supports.   5
       b. Determine the reactions at the support for a simple beam having hinged support at one end   9
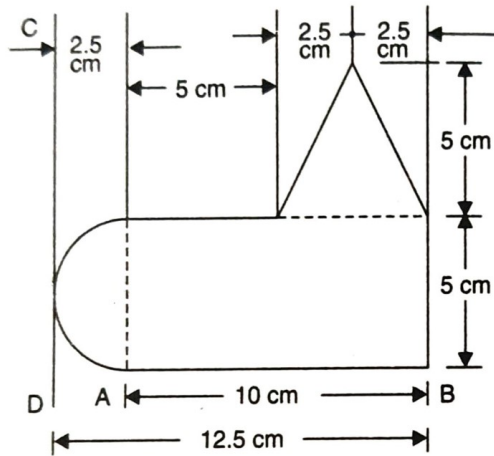   and roller support at the other end.
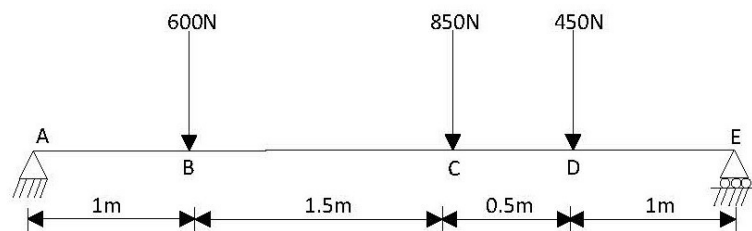
OR

14.   Estimate the magnitude, position and direction of the resultant of coplanar forces shown in the   14
       figure with respect to the point A.
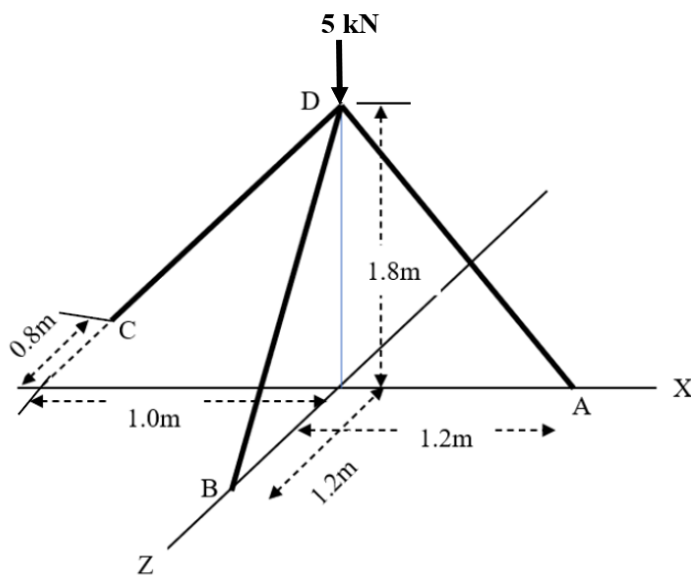

MODULE III

15.   Determine the centroid of the lamina shown in the figure.   14

16. A tripod supports a load of 5kN as shown in the figure. The ends A, B, and C are in the X-Z 14 plane. Find the force in the three legs of the tripod.

5 kN

D

1.8m
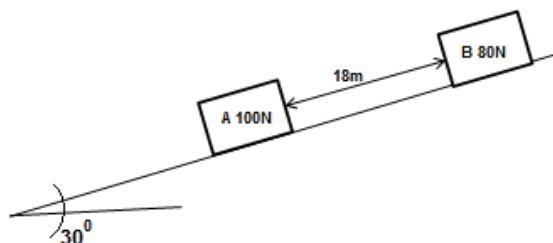
0.8m C

1.0m

A X

1.2m

B

1.2m

Z

MODULE IV

17. A) A projectile is aimed at a target on the horizontal plane and falls 12 m short when angle of 10 projection is 15° while it over shoots by 24 m when angle is 45°. Find angle of projection to hit the target.

B) Define 4
i- Velocity of Projection   ii- Trajectory   iii- Range   iv- Time of Flight

18. 14

B 80N

18m

A 100N

30⁰

Two blocks A and B shown in figure are released simultaneously from rest. Determine the time at which block A hits block B. Coefficient of friction between block A and surface is 0.3 and between block B and surface is 0.5.

MODULE V

19. a) Determine the weight, which is to be connected to a spring of stiffness 5 N/cm, so that the weight is oscillating with a time period of 1 second.   4

b) The frequency of free vibrations of weight 'W' connnected to a spring with a stiffness 'k', is 12 cycles per second. When an extra weight of 20N is coupled with weight 'W', the frequency reduces to 10 cycles per second. Find the weight 'W' and stiffness 'k' of the spring.   10

OR

20. A cylindrical roller 50cm diameter is in contact with two horizontal conveyor belts running at uniform speeds of 5m/s and 3m/s as shown in figure. Assuming that there is no slip at the points of contact, determine i) The position of the instantaneous center of the roller ii) The linear velocity of the center C iii) Angular velocity of the roller   14

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