C **617B1** **Total pages: _**

Register No: …… Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER B.TECH DEGREE EXAMINATION (S, FE), NOVEMBER 2024

(2020 SCHEME)

Course Code : **20EST100**

Course Name : **Engineering Mechanics**

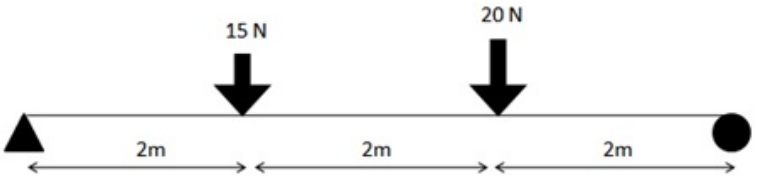
Max. Marks : **100** **Duration:3 Hours**

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

PART A

(Answer all questions. Each question carries 3 marks)

1. Explain the principle of transmissibility with a neat sketch.
2. Define system of forces and explain any two systems of forces.
3. Define coefficient of friction and angle of friction. Establish the relation between them.
4. A beam 6m long is loaded as shown in the figure given below. Calculate the reactions at the supports.



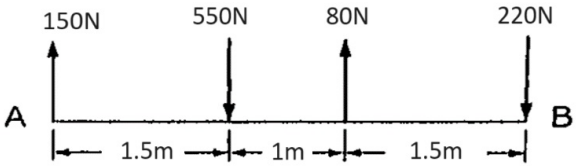
5. Define the following, a) centroid b) centre of gravity.
6. Obtain an expression for the area of surface generated when a line of length 'L' revolves about an axis. One end of the line is touching the axis and the other end is at a distance 'r' from the axis.
7. Explain the concept of the work-energy theorem in translational motion.
8. How are kinematics and kinetics differentiated and organized within the field of engineering dynamics ?
9. Explain the significance of instantaneous centre in the analysis of rigid body undergoing rotational motion.
10. Describe rigid body rotation. Give an example.

PART B

(Answer one full question from each module, each question carries 14 marks)

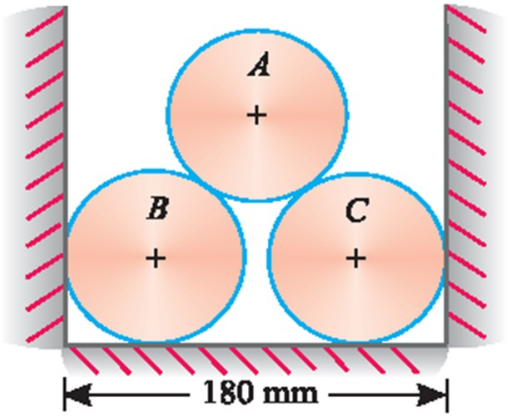
MODULE I

11. A beam is subjected to forces as shown in the figure. Reduce the given force system to (i) a single force (ii) an equivalent force couple system at A (iii) an equivalent force couple system at B. 14



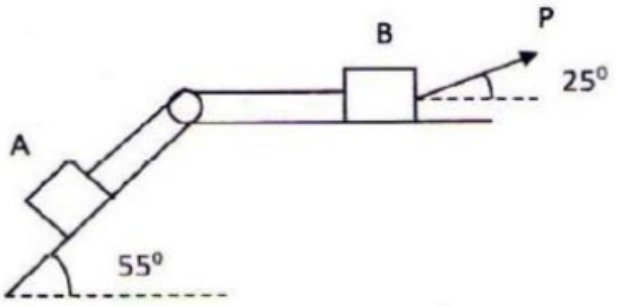
OR

12. Three cylinders weighing 100 N each and 80 mm in diameter are placed in a channel of 180 mm width. Determine the reactions at contact points. 14



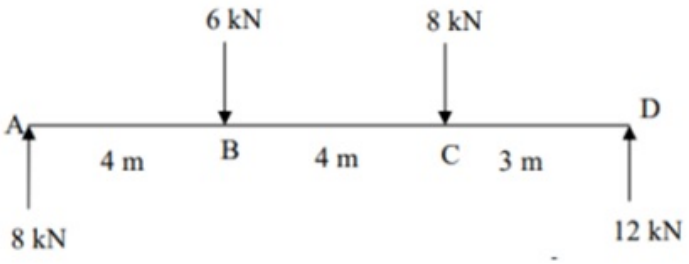
MODULE II

13. Two blocks A and B of weights 10 kN and 5kN respectively connected by a wire is passing over a smooth pulley as shown in the figure. Determine the magnitude of force P required to prevent the movement of block A down the plane. Take the coefficient of friction between blocks and both surfaces as 0.50. 14



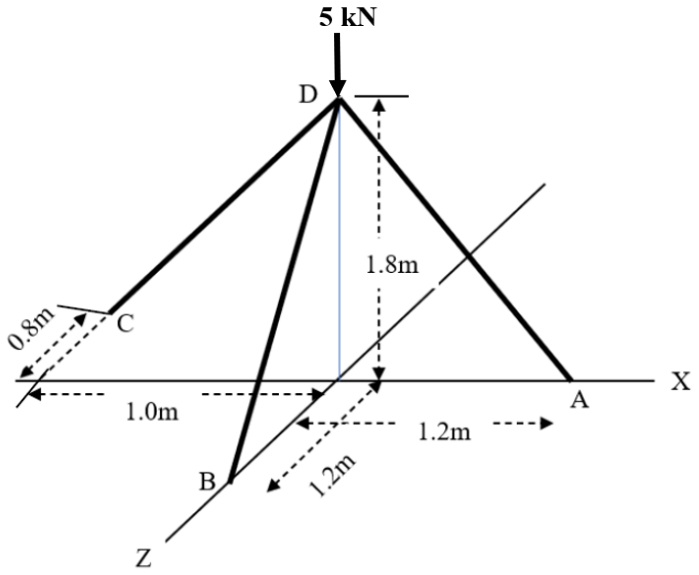
OR

14. A rigid bar AD is acted upon by forces as shown in the figure below. 14
(i) Reduce the force system to a single force system
(ii) Single force and couple at D
(iii) Single force and couple at A



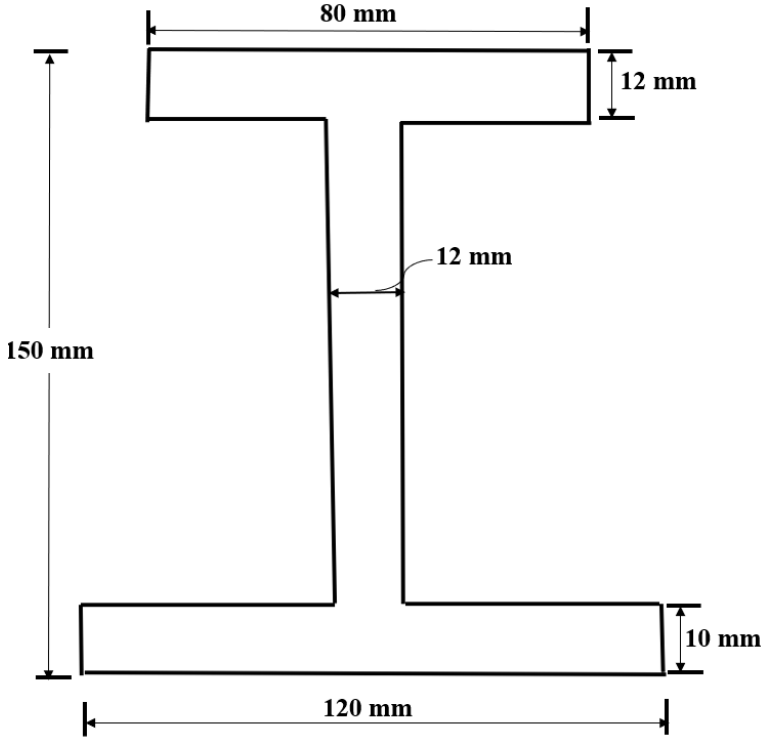
MODULE III

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



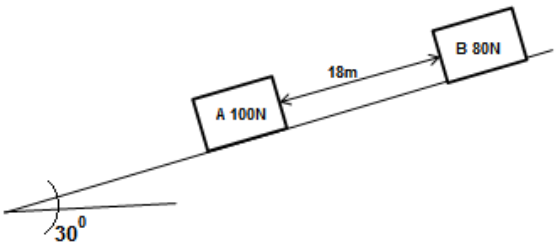
OR

16. Find the polar moment of inertia of the I section about the centroidal axes. 14



MODULE IV

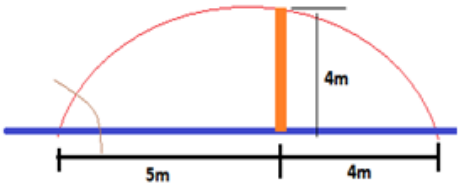
17. 14



For the two blocks shown in figure starting from rest; in what time block B reaches block A. Coefficient of friction between block A and surface is 0.2 and between block B and surface is 0.4.

OR

18. 14



Find least initial velocity with which a projectile is to be projected so that it clears a wall of 4 m height located at a distance of 5m and strikes the ground at a distance 4m beyond the wall. The point of projection is at same level as foot of the wall.

MODULE V

19. a) A particle has SHM. Its maximum velocity is 6m/s and maximum acceleration is 12m/s^2. Determine the angular velocity and amplitude. Also determine its velocity and acceleration when displacement is half of the amplitude. 7

b) A spring stretches by 0.015m when a 1.75kg object is suspended from its end. How much mass should be attached to the spring so that its frequency of vibration is 3Hz. 7

OR

20. a) A particle moving with simple harmonic motion has velocities of 8m/s and 4m/s when at the distance of 1m and 2m from the mean position. Determine (i) amplitude, (ii) period, (iii) maximum velocity, and (iv) maximum acceleration of the particle. 10

b) A flywheel of mass 5tonne starts from rest and gets up a speed of 150rpm in 3minutes. Find the average torque exerted on it if the radius of gyration of wheel is 50cm. 4

****