

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER B.TECH DEGREE EXAMINATION (S), FEBRUARY 2023

(2020 SCHEME)

Course Code: 20EST100

Course Name: Engineering Mechanics

Max. Marks: 100

Duration: 3 Hours

PART A

(Answer all questions. Each question carries 3 marks)

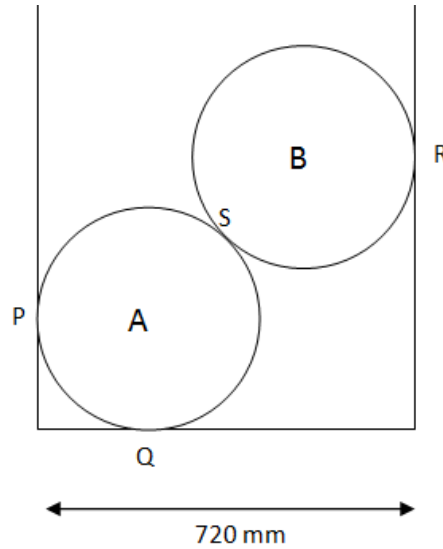
1. State Principle of transmissibility and Principle of superposition.
2. Explain Free Body Diagram with two examples.
3. Explain angle of friction and coefficient of friction.
4. List any three types of supports and draw the Free Body Diagrams of the same.
5. Explain Radius of gyration with a neat sketch.
6. State the theorems of Pappus Guldinus.
7. Motion of a particle is given by $s=t^3-3t^2-9t+12$. Determine the time, position and acceleration when its velocity becomes zero.
8. State Work-Energy equation.
9. What is instantaneous centre? How do you locate it?
10. An 18N weight is hung from the end of a helical spring and is set vibrating vertically. The weight makes 4 oscillations per second. Find the stiffness of the spring.

PART B

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

MODULE I

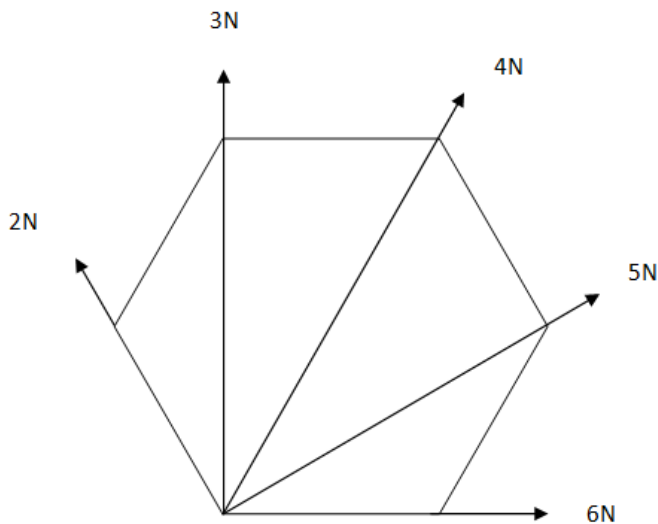
11. a) Two smooth cylinders A and B of diameter 400mm and weight (10) 200N rest on a horizontal channel having base width 720mm as shown in figure. Find the reactions at P, Q, and R.



- b) State and prove Varignon's Theorem. (4)

OR

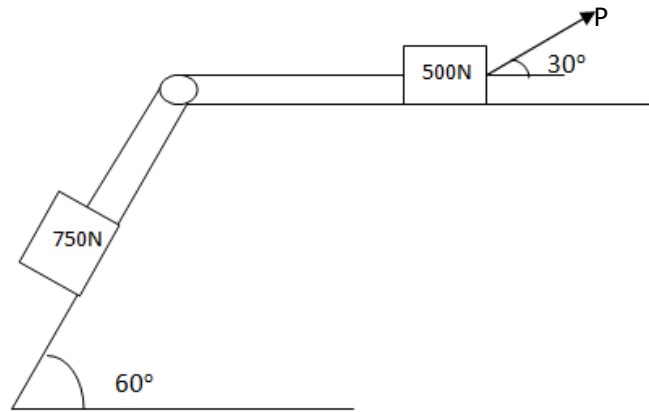
12. a) Forces of 2N, 3N, 4N, 5N and 6N act at an angular point of a regular hexagon towards the other angular points taken in order. Find the resultant. (7)



- b) F_1 and F_2 are 2 collinear forces. When they act in opposite directions, their resultant is 34N. When they act at right angles to each other, their resultant is 50N. Find F_1 and F_2 . (7)

MODULE II

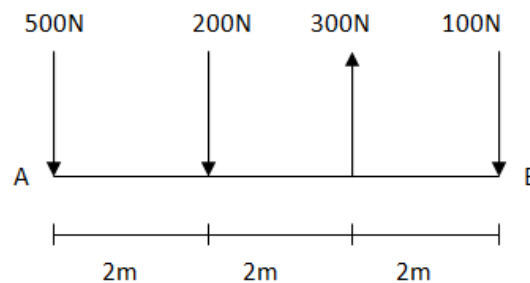
13. a) What is the value of P in the system shown in figure to cause the motion to impend? Assume the pulley is smooth and the coefficient of friction between all the contact surfaces is 0.2. (10)



b) Elucidate Coulomb's Laws of friction. (4)

OR

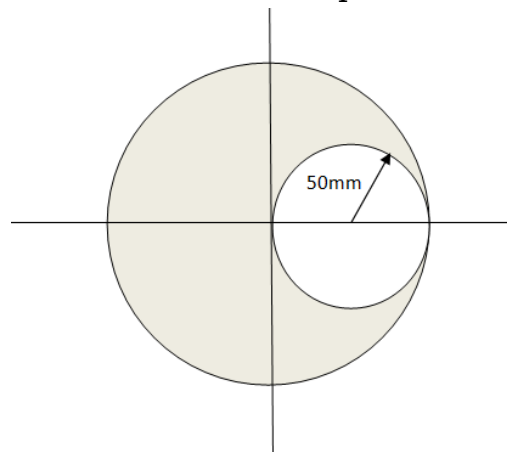
14. a) Replace the given system of forces into (10)
 i) A single force
 ii) A force couple system at A
 iii) A force couple system at B



b) What is a couple? What are the properties of a couple? (4)

MODULE III

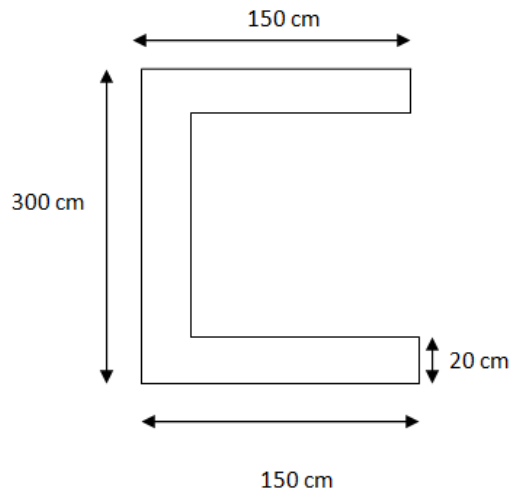
15. a) Determine the centroid of the shaded portion. (10)



b) Explain Parallel axis theorem with its proof. (4)

OR

16. Determine the moment of inertia of the C section with uniform (14)
 thickness about the centroidal x axis and y axis.

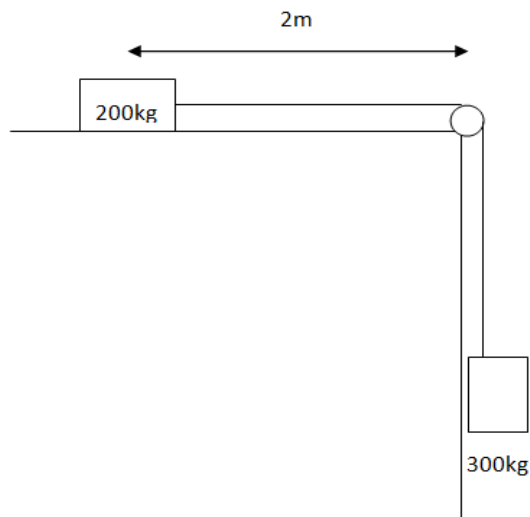


MODULE IV

17. a) A block weighing 1000N rests on a horizontal plane. Find the magnitude of the force required to give the block an acceleration of 2.5m/s^2 to the right. The coefficient of friction between the block and the plane is 0.25. (9)
- b) A pilot flying a bomber at a height of 1000m with uniform horizontal velocity of 30m/s wants to strike a target on the ground. At what distance from the target should he release the bomb? (5)

OR

18. a) Two blocks are joined by an inextensible string as shown in figure. If this system is released from rest, determine the velocity of the block after it has moved 2m. Assume the coefficient of friction between block and plane as 0.25. Pulley is weightless and frictionless. (9)



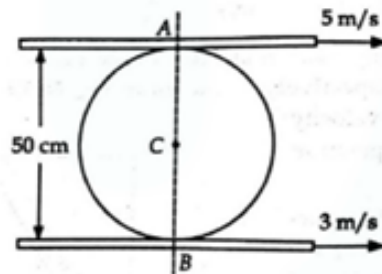
- b) An elevator has an upward acceleration of 1m/s^2 . What pressure will be transmitted to the floor of the elevator by a man weighing 600N travelling in the elevator? What pressure will be transmitted if the elevator has a downward acceleration of 2m/s^2 ? (5)

MODULE V

19. a) A body is moving with Simple Harmonic Motion and has velocities of 8m/s and 3m/s at distances of 1.5m and 2.5m respectively from the centre. Find the amplitude and time period of the body. (9)
- b) Power supply was cut off to a power-driven wheel when it was rotating at a speed of 900rpm . It was observed to come to rest after making 360 revolutions. Determine its angular retardation and time it took to come to rest after power supply was cut off. (5)

OR

20. a) 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 (9)
- The position of the instantaneous center of the roller
 - The linear velocity of the center C
 - Angular velocity of the roller



- b) A weight of 50N suspended from a spring vibrates vertically with an amplitude of 8cm and a frequency of 1 oscillation/sec. Find (5)
- Stiffness
 - Max tension induced in spring
 - Maximum velocity
