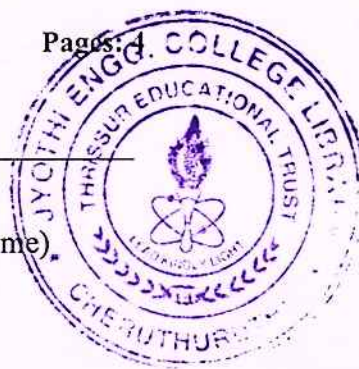


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S1 (S,FE) S2 (S,FE) Examinations May 2026 (2019 Scheme)



Course Code: EST100

Course Name: ENGINEERING MECHANICS
(2019 -Scheme)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks

Marks

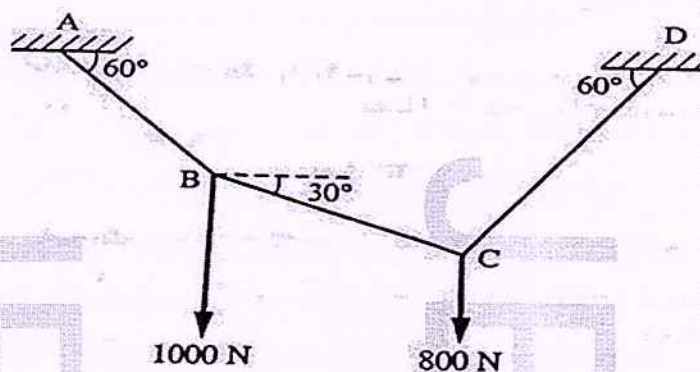
- | | | |
|----|--|-----|
| 1 | Two forces act at an angle of 120° . The bigger force is of 40 N and the resultant is perpendicular to the smaller one. Find the smaller force. | (3) |
| 2 | Explain Varignon's theorem of moments. | (3) |
| 3 | Define friction. List Coulomb's law of dry friction. | (3) |
| 4 | Explain different types of supports in beams. | (3) |
| 5 | Explain about radius of gyration of an area. | (3) |
| 6 | State and prove Pappus Guldinus Theorem of area. | (3) |
| 7 | A motor car takes 10 seconds to cover 30 meters and 12 seconds to cover 42 meters. Find the uniform acceleration of the car. | (3) |
| 8 | State work energy principle in dynamics. | (3) |
| 9 | The angle of rotation of a body given by the equation $\theta = 2t^3 - 5t^2 + 8t + 3$. Determine angular velocity and angular acceleration when $t = 0$ second. | (3) |
| 10 | Define the terms i) Amplitude ii) Time period iii) Frequency | (3) |

PART B

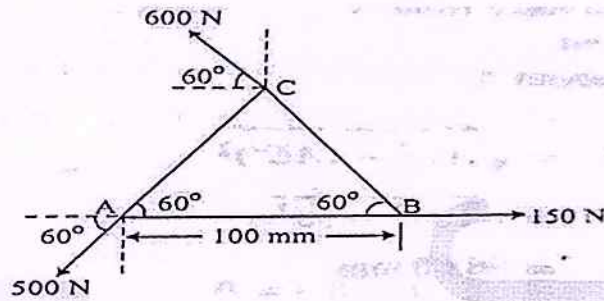
Answer one full question from each module, each question carries 14 marks.

MODULE 1

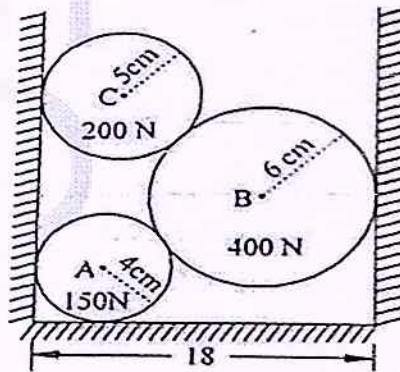
- 11 a Determine the tensions in the strings AB, BC and CD as shown in figure (8)



- b Find the resultant force for system of forces shown in figure. (6)

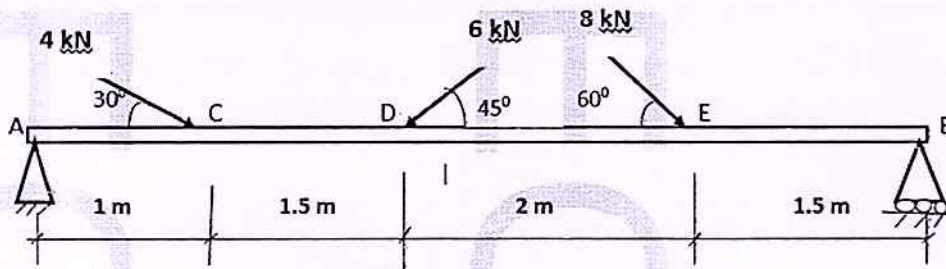


- 12 Three cylinders are piled in a rectangular ditch shown in figure. Neglecting friction, determine the reaction between cylinder A and vertical wall. (14)



MODULE 2

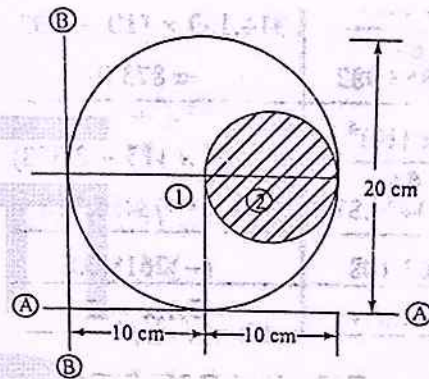
- 13 Find the reactions at the supports. Forces of 4, 6 and 8 kN are at C, D, E at 30° , 45° , 60° respectively to AB as shown in figure. (14)



- 14 a A uniform ladder, 25 m long and weight W , is placed against a wall which it makes 45° . A man whose weight 0.6 times that of the ladder climbs up the ladder. At what position along the ladder from the bottom end does the ladder slip? The coefficient of friction between the ladder and wall is 0.25 and that between ground with the ladder is 0.3. (9)
- b ABCD is a square whose side length is 2 m. Forces of magnitude 10, 20, 80 and 50 N act along AB, BC, CD and DA respectively. Forces of magnitude $50\sqrt{2}$ N and $20\sqrt{2}$ N act along the diagonal AC and DB respectively. Show that they are equivalent to a couple and calculate the moment of this couple. (5)

MODULE 3

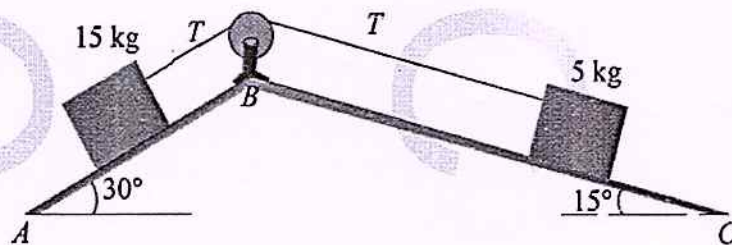
- 15 Determine the moment of inertia of the non-shaded area of the figure about its centroidal axes. (14)



- 16 The line of action of three forces concurrent at the origin O passes respectively through points A , B and C having coordinates $X_A = -1$, $Y_A = 2$, $Z_A = 4$; $X_B = 3$, $Y_B = 0$, $Z_B = -3$; $X_C = 2$, $Y_C = -2$, $Z_C = 4$. The magnitude of forces are $F_A = 40$ N, $F_B = 10$ N and $F_C = 30$ N. Find the magnitude and direction of their resultant. (14)

MODULE 4

- 17 Two rough planes inclined at 30° and 15° to the horizontal and of the same height are placed back to back. Two bodies of masses of 15 kg and 5 kg are placed on the faces and connected by a string over the top of the planes. If the coefficient of friction is 0.3, find the acceleration of body and tension in the string. (14)



- 18 a A particle falls from rest and in the last second of its motion it passes 80 m. Find the height from which it fell and the time of its fall. (6)
- b A boy throws a ball so that it may just clear a wall 3.6m high. The boy is at distance of 4.8 m from the wall. The ball was found to hit the ground at a distance of 3.6 m on the other side of the wall. Find the least velocity with which the ball can be thrown. (8)

MODULE 5

- 19 a A wheel accelerates from rest to a speed of 180 rpm uniformly in 0.4s. It then rotates at that speed for 2s before decelerating to rest in 0.3s. Determine the total revolutions made by the wheel. (9)
- b A right circular disc of weight 1500N and 750mm diameter is free to rotate about its geometric axis is constantly accelerated from rest to 300rpm in 20s. Determine the constant torque required to produce this acceleration. (5)
- 20 a A body moving with SHM has amplitude of 1m and period of oscillation is 2second. Find the velocity and acceleration of the body at $t=0.4$ second when time is measured from i) the mean position ii)the extreme position. (8)
- b A body of mass 50kg is suspended by two springs of stiffness 4 kN/m and 6kN/m as shown in Figure. The body is pulled 50mm down from its equilibrium position and then released. Calculate i) the frequency of oscillation ii)maximum velocity iii)maximum acceleration (6)

