

Course Code: EST 100**Course Name: ENGINEERING MECHANICS
(2019 -Scheme)**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 3 marks*

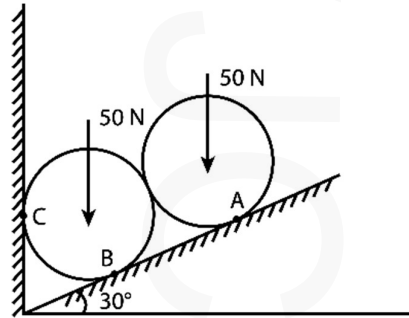
Marks

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|----|--|-----|
| 1 | Explain Principle of transmissibility with neat sketch. | (3) |
| 2 | Two forces of magnitude 15 N and 12 N are acting at a point. If the angle between the two forces is 60° , determine the resultant of the forces in magnitude and direction. | (3) |
| 3 | A body weighing 150 N is placed on a rough horizontal plane. If the coefficient of friction between the body and the horizontal plane is 0.4, determine the horizontal force required to just slide the body on the plane. | (3) |
| 4 | List the Coulomb's laws of friction. | (3) |
| 5 | Distinguish between centroid and centre of gravity. | (3) |
| 6 | A force $F=2\mathbf{i} + 3\mathbf{j} - 4\mathbf{k}$ is applied at the point B (1,-1,2). Find the moment of the force about a point A (2,-1,3). | (3) |
| 7 | Define rectilinear translation. What are the assumptions taken during the study of the motion of connected bodies? | (3) |
| 8 | State and explain D'Alembert's principle. | (3) |
| 9 | Define SHM. What are the general conditions for a periodic motion to be simple harmonic? | (3) |
| 10 | Illustrate the significance of instantaneous Centre in the analysis of rigid body undergoing rotational motion. | (3) |

PART B*Answer one full question from each module, each question carries 14 marks.***MODULE 1**

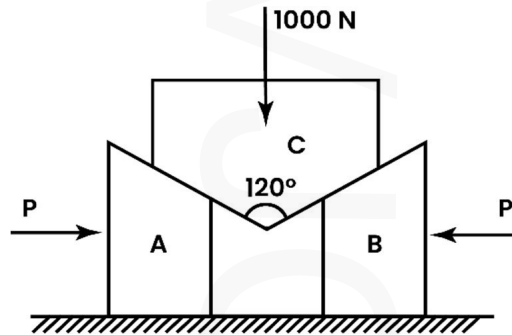
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| 11 | In a regular hexagon ABCDEF the forces 4, F_1 , F_2 , 9 and 8 kN act along AB, CA, AD, AE and FA respectively and point A is in equilibrium. Determine the values of F_1 and F_2 . | (14) |
|----|--|------|

- 12 Two identical rollers, each weighing 50 N, are supported by an inclined plane and a vertical wall as shown in Fig. Find the reactions at the points of supports A, B and C. Assume all the surfaces to be smooth. (14)

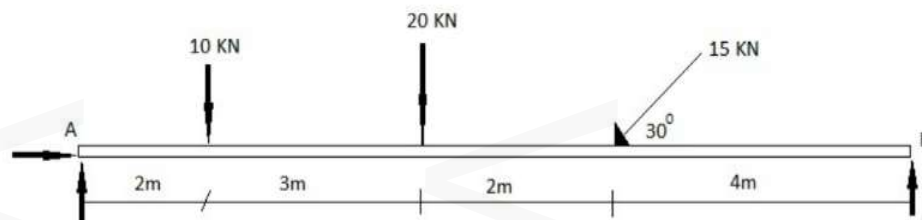


MODULE 2

- 13 Two wedges A and B are used to raise another block C weighing 1000 N as shown. Assuming the coefficient of friction as 0.25 for all the surfaces, determine the value of P for impending motion of block C. (14)

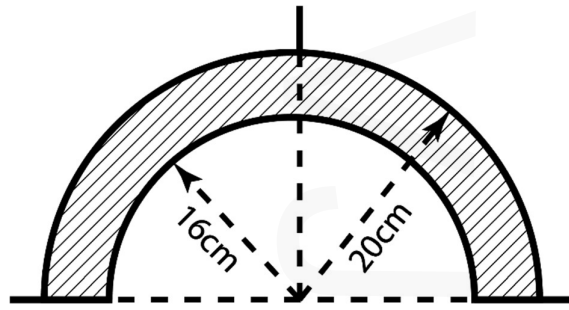


- 14 A beam is hinged at A and roller supported at B. It is acted upon by loads as shown below. Find the reactions at A & B. (14)



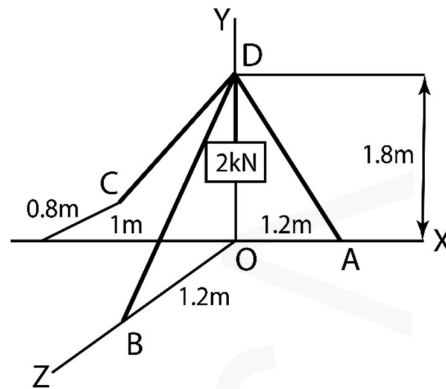
MODULE 3

- 15 Calculate the Moment of Inertia of shaded area with respect to its centroidal axes. (14)



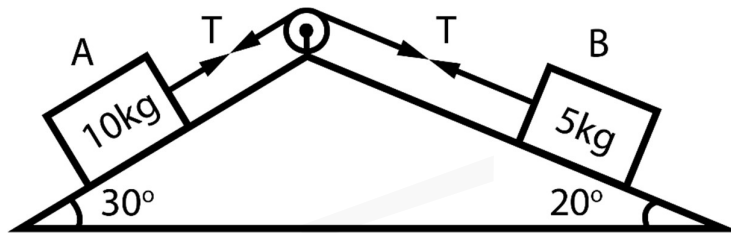
All dimensions are in cm.

- 16 A tripod supports a load of 2 kN as shown. The ends A, B and C are in the X-Z plane. Find the force in the three legs of the tripod. (14)



MODULE 4

- 17 Two smooth inclined planes whose inclinations with the horizontal are 30° and 20° and are placed back-to-back. Two bodies of masses 10 kg and 5 kg are placed on them and are connected by a string. Calculate the tension in the string and the acceleration of the bodies. (14)



- 18 A car enters a curved portion of the road with a radius of 200 m travelling at a constant speed of 36 kmph. Determine the component of velocity and acceleration (14)

of the car in X and Y directions 15 seconds after it has entered the curved portion of the road.

MODULE 5

- 19 The weight of an empty railway wagon is 24 kN. On loading it with goods (14) weighing 320 kN, its spring gets compressed by 80 mm.
- Calculate its natural frequency of vibration when the wagon is empty and loaded as above.
 - It is set into natural vibrations with an amplitude of 100 mm when empty. Calculate the velocity of the railway wagon when its displacement is 40 mm.
- 20 The composite pulley shown in the figure weighs 800 N and has a radius of gyration of 0.6 m. The 200-kilogram and 400-kilogram blocks are attached to the pulley by strings. determine the tension in the string and angular acceleration of the pulley. (14)

