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Name of Examination : **Winter 2020** - (Preview)

Course Code & Course Name : **CE151U - Engineering Mechanics**

Generated At : **18-04-2022 16:58:20**

Maximum Marks : **60**

Duration : **3 Hrs**

Edit **Print** **View Answer Key** **Close** **Answer Key Submission Type:** Marking scheme with model answers and solutions of numerical

Instructions:

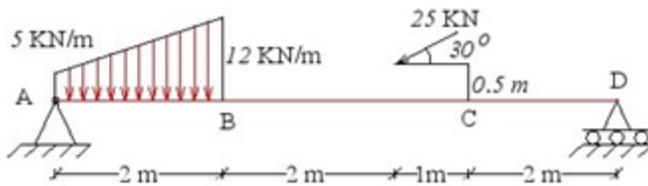
1. All questions are compulsory and solve any three bit out of a, b, c and d.
2. Illustrate your answer with suitable figures/sketches wherever necessary.
3. Assume suitable additional data; if required.
4. Use of logarithmic table, drawing instruments and non programmable calculators is allowed.
5. Figures to the right indicate full marks.

1) a) Define resultant force and solve [5]

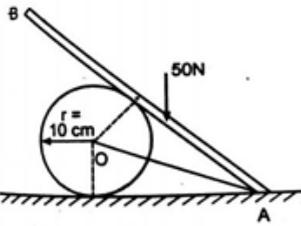
The boat is drive uniformly along the river stream at a given speed with a force of 600 N, which is achieved by two forces F_1 & F_2 which makes the angle of 35° and 42° respectively with the direction of motion. Determine the magnitude of forces F_1 and F_2 .

b) Explain the principle of transmissibility of the force [5]

c) Determine the reactions at supports A and D for the given beam as shown in Figure [5]

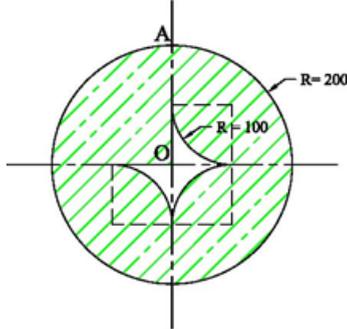


d) A smooth cylinder of radius $R=10$ cm resting on horizontal surface, supports a bar AB of length 30 cm which is hinged at A. The weight of bar is 50 N. The cylinder is kept from rolling away by string AO of length 20 cm. Assuming all surfaces to be frictionless, find the tension in the string. [5]

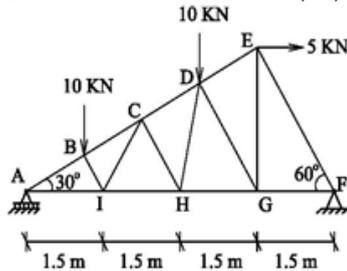


2) a) Define moment of inertia and state and prove parallel axis theorem [5]

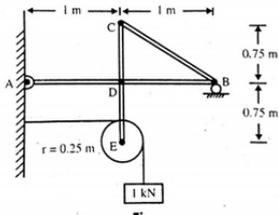
b) Determine the angle of inclination of line AO with respect to vertical so that the lamina is suspended from the point A; if the thickness is uniform. Refer Figure below [5]



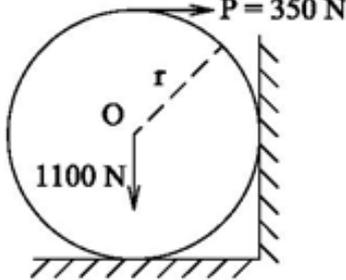
c) Determine the forces in members CD, DH, and HG of a given truss by method of section only. [5]



d) A frame structure shown supports a load of 1 kN find the force in the bar BC. And the reaction at D. The radius of pulley is 0.25 m [5]

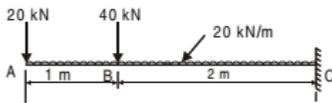


3) a) A horizontal force of 350 N is applied to a cylinder of weight 1100 N as shown in figure if $\mu = 0.25$. Determine whether the given force will cause slipping to the cylinder [5]



b) Explain angle of repose and cone of friction [5]

c) Draw the shear force and bending moment diagram for a given beam [5]



d) A circular rod of diameter 16 mm and 500 mm long is subjected to a tensile force 40 kN. The modulus of elasticity for steel may be taken as 200 kN/mm^2 . Find stress, strain and elongation of the bar due to applied load. [5]

4) a) State D'Alembert Principle and solve [5]

A man of 40 kg mass runs with velocity of 6 m/s and jumps into a boat of mass 87 kg which is at rest in water. Find the velocity with which the boy and boat will move together. Also find the amount of kinetic energy lost in it.

b) The motion of particle is described by the following equations [5]

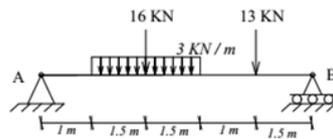
$$x = t^2 + 8t + 4$$

$$y = t^3 + 3t^2 + 8t + 4$$

Determine

1. Initial velocity of a particle
2. Velocity of particle when $t = 2$ sec
3. Acceleration of particle at $t = 2$ sec

c) State principle of virtual work and solve the given beam by principle of virtual work [5]



d) A force given by $F = 3t^2 + 5t - (8t^3 + 400)$ N acts from $t = 0$ to $t = 10$ s. Determine the impulse of the force. If this impulse acted at the centre of mass of a body of mass 500 kg and brought it to rest, estimate the velocity of the body before it acted [5]

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