CHITTAGONG UNIVERSITY OF ENGINEERING & TECHNOLOGY

B. Sc. Engineering Level-1 Term-I, Final Examination 2020

Subject : Civil Engineering

Paper : Engineering Mechanics (CE-101)

Time : 3 Hours Full Marks : 200

(This examination is conducted according to the decision of 135th Academic Council Meeting)

Answer any TWO questions from EACH section. Use separate script for EACH section. The figures in the right margin indicate full marks. Use standard value if needed.

SECTION-A

Q.1 (a) In Fig. 1(a), the homogeneous body A weighs 1200lb. Determine the weight W when the body A is on the point of turning over, and thus corresponding tension in the cord. Pulleys are weightless and smooth. $\theta=30^0$ and $f_A=1/3$ (27)

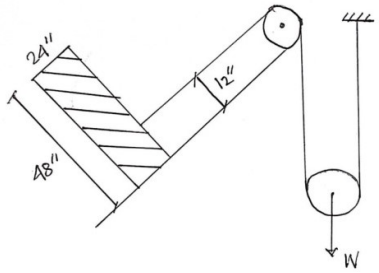

Fig. 1(a)

(b) The bodies A and B in Fig. 1(b) are moving toward the right at 20fps. Let $W_A=600$lb, $W_B=200$lb, $f_A=1/4$, and neglect the weight of the cable and pulley and the friction at the pulley. What constant force P will bring the bodies to rest in a distance of 40ft? What is the tension in the cable? (23)

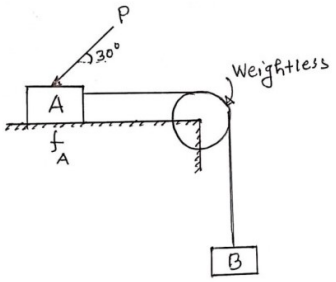

Fig. 1(b)

Q.2 (a) In the system of sheaves shown in Fig. 2(a), what force F will hold a weight of W=1000lb in equilibrium? There are no frictional losses at the axes. (15)

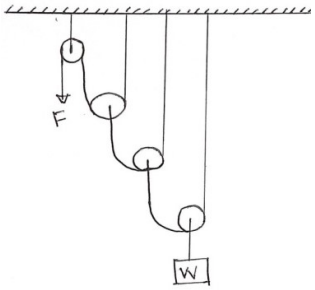

Fig. 2(a)

(b) A body has an angular motion such that $\alpha = C \sin\theta$, where C is a constant. Determine the expressions for the normal and tangential accelerations for a point on this body at a radius r. (15)

(c) In the Fig. 2(c), CD is a rigid weight less body. The pegs are smooth and the cable is weightless and flexible. Determine weight of A & B, if the bodies are in equilibrium and CD remains horizontal. (20)

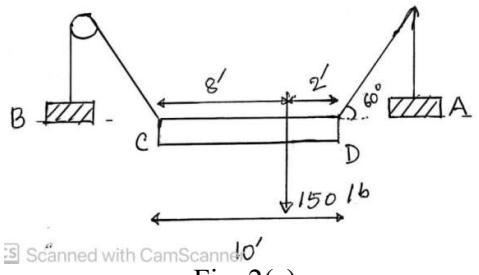

Fig. 2(c)

Q.3 (a) In the Fig. 3(a), W=1000lb, P=2000lb, T=3000lb and θ=15^0. What force F will result in the body being on the point of moving over the obstruction. What is the reaction at B? (22)

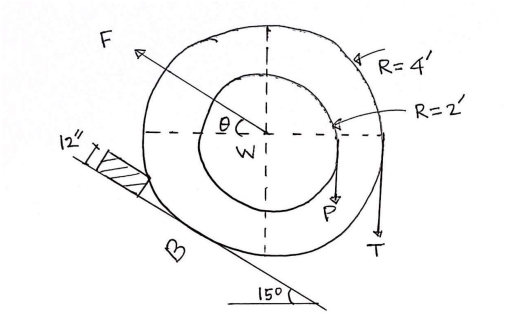

Fig. 3(a)

(b) Two cables A & B terminate on a pole as shown in Fig. 3(b) and exert force in the horizontal plane at C. he gay cable CD makes an angle with the pole of 45^0 and the anchor at D is to be so located that the pole will have only a compressive load. Let θ=30^0, A=5000lb, B=8000lb & CE=25′. Find the value of angle α and tension in the cable CD. (28)

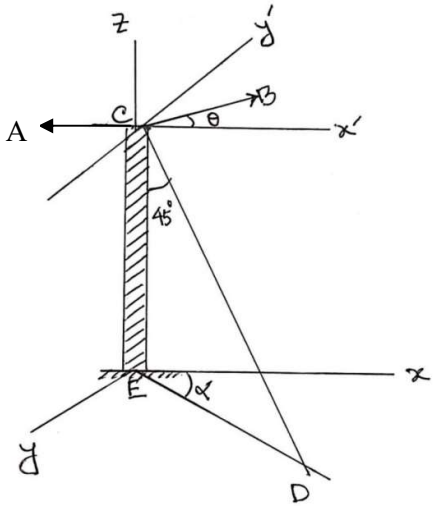

Fig. 3(b)

SECTION-B

Q.4 (a) Determine X and Y coordinates of the centroid of the shaded area shown in Fig. 4(a). (25)

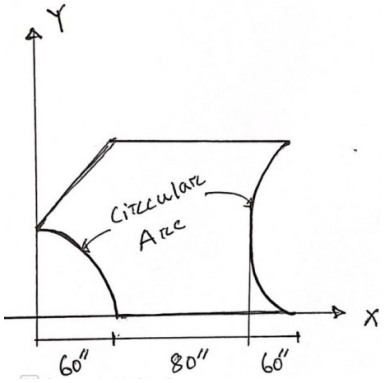

Fig. 4(a)

(b) Calculate the moment of inertia of the shaded area as shown in Fig. 4(b) about the X axis and the line y=9inch. (25)

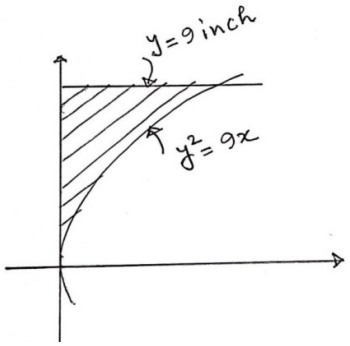

Fig. 4(b)

Q.5 (a) Find the member forces of the truss shown in Fig. 5(a). (28)

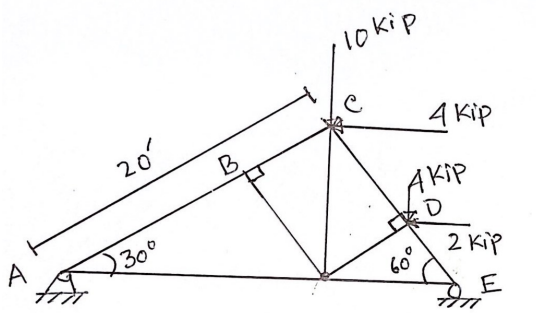

Fig. 5(a)

(b) A glass rod AB, in Fig. 5(b), weighs 10lb and 8inch long. It is placed in a glass tumbler C in a position of equilibrium similar to that shown. If the tumbler is 3inch in diameter and if all surfaces are smooth, what is the angle θ? (22)

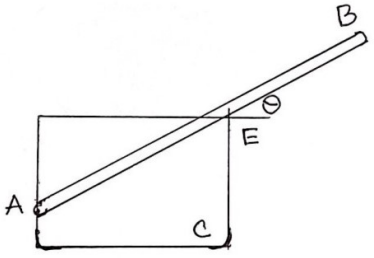

Fig. 5(b)

Q.6 (a) Find I_x and I_y for the area enclosed by $y^2=4x$ and $y=x$ (25)

(b) In Fig. 6(b), 128lb body A, is on a $\theta=15^0$, incline, where f=0.20. At a certain instant, the solid cast iron cylinder B is rotating at 40rpm and the block A is being moved up the incline by virtue of the cable connection shown. The cable CB wraps around the 2-ft cylinder B. After A moves 20ft up the incline, it comes to rest. What is the weight of the cylinder B? Neglect the axial friction for B and C and the mass of the pulley C. (25)

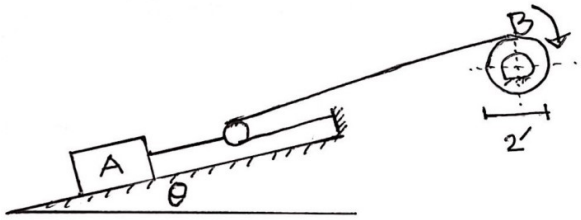

Fig. 6(b)

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