

Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
 B. Sc. Engineering 1st Year 2nd Term Regular Examination, 2016
CE 1201
 (Engineering Mechanics)

Full Marks: 210

Time: 3 hrs

- N.B.**
- i) Answer any three questions from each section in separate script.
 - ii) Figures in the right margin indicate full marks.
 - iii) Assume reasonable value for any missing data.
 - iv) All figures are not drawn in scale.

Section – A

- 1/ (a) Define – (i) Transmissibility of force system (ii) Two force member (iii) Free - body diagram (iv) Equilibrium (v) Zero force member (10)
- (b) Draw the free body diagram of members of the following structures. (13)

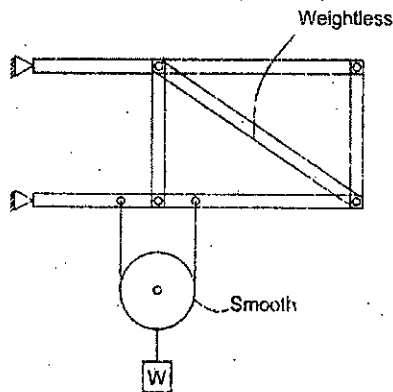


Figure - (i)

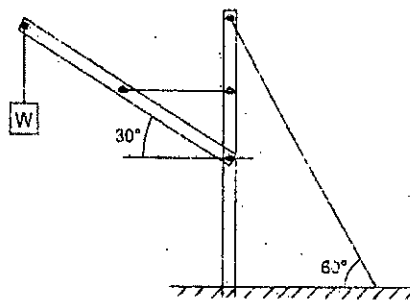
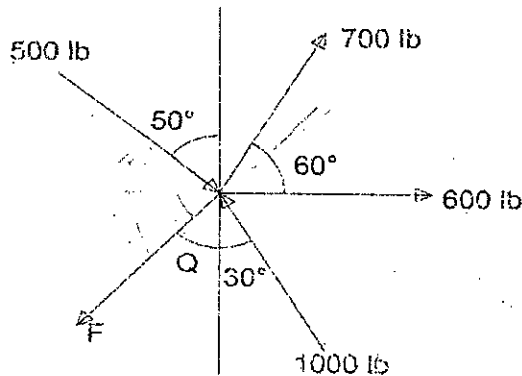
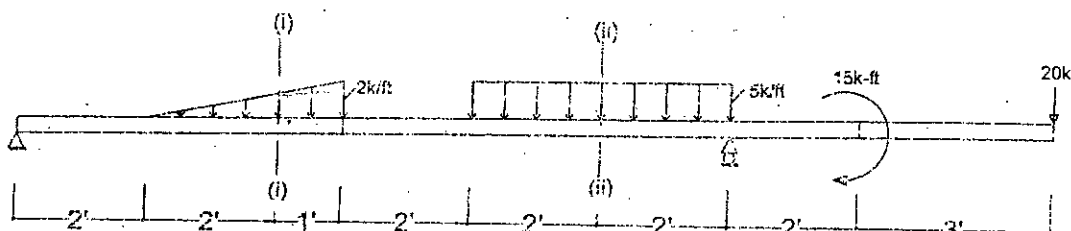


Figure - (ii)

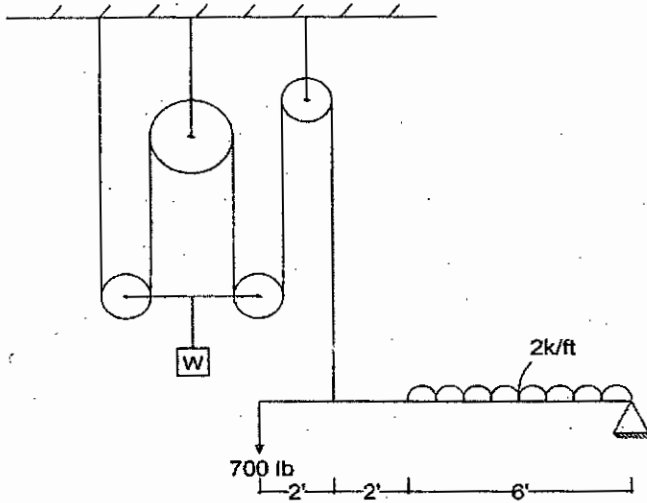
- (c) Find the value of F and Q of the following force system shown in figure below. Also find the resultant of that force system. (12)



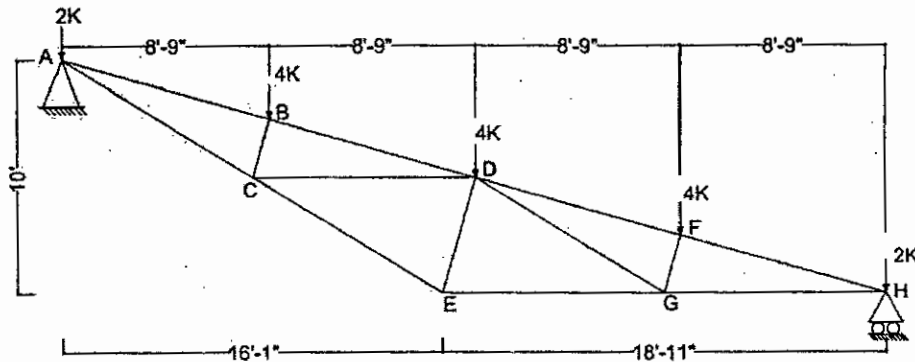
2. (a) Define shear and bending moment. A simply supported beam is loaded as shown in figure below. Find (i) The reaction of A and B and (ii) Bending moment and shear at section (i)-(i) and (ii)-(ii). (20)



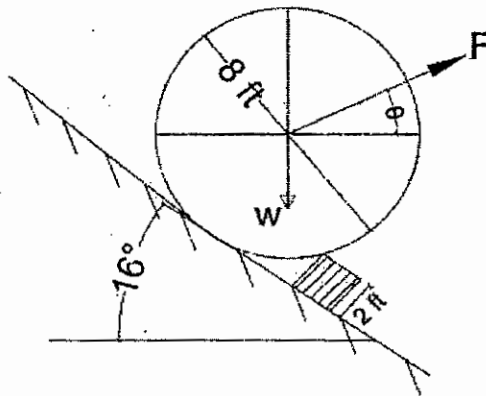
- (b) In the following figure, what will be the value of 'W' if equilibrium exists? Assume (15)
the pulleys are frictionless and weightless.



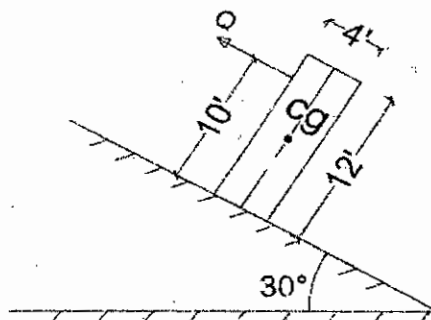
3. (a) Determine the force of the members located to the right of DE for the inverted (22)
Howe roof truss.



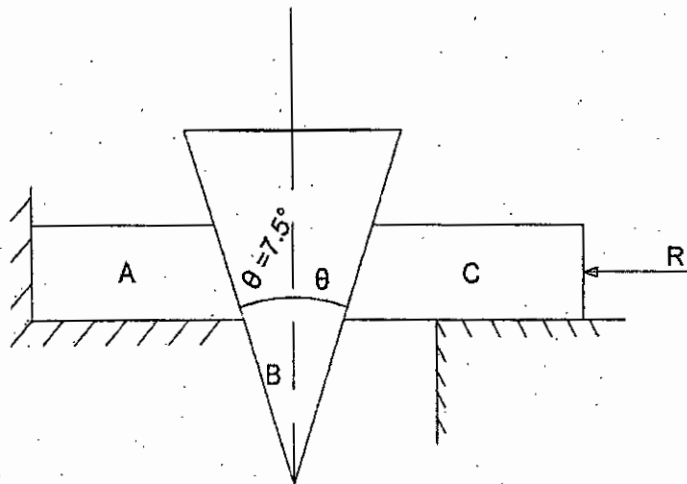
- (b) The wheel shown in figure given below is on the point of rolling over the block. If (13)
 $W=100$ lb, What is the magnitude and sense of the least force F that will produce
this condition.



4. (a) Distinguish between angle of friction and angle of repose. (05)
(b) State the laws of friction. A relative tall and slender body be as shown in figure (15)
below with a gradually increasing force Q applied to it, if $W = 105$ lb, $f = 0.3$ and
inclination of the plane is 30° , will the body slider or tip over?

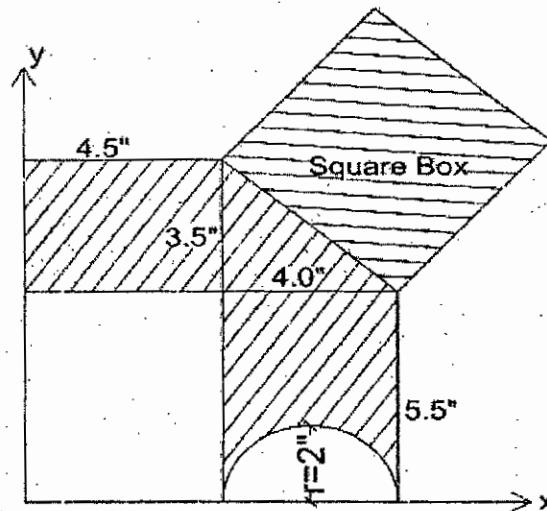


- (c) Find the force Q on the top of the wedge. Given that $W_A = 200$ lb, $W_B = 500$ lb, $W_C = 5000$ lb and Force $R = 8000$ lb. Neglect all friction so that the reactions are normal to the surfaces. (15)

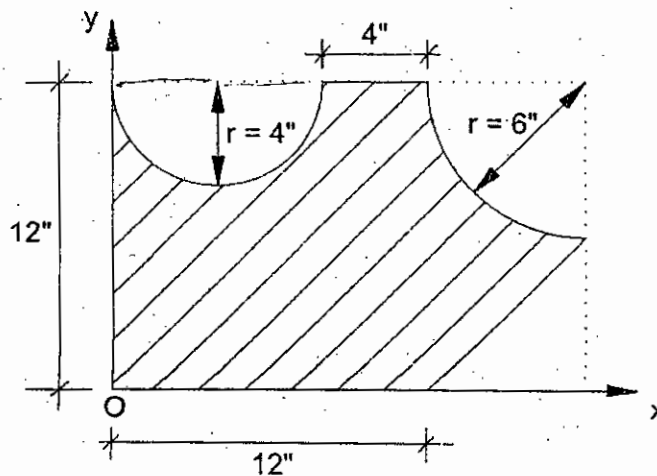


Section - B

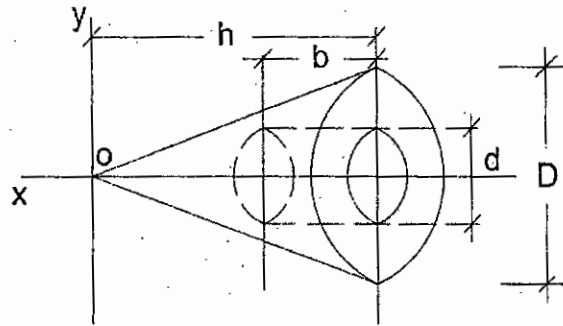
5. (a) Define Centroid. Briefly describe the real life applications of centroid. Find the centroid of a triangle, whose altitude h and has a base b . (15)
- (b) Compute \bar{x} and \bar{y} of the shaded area shown in figure below. (20)



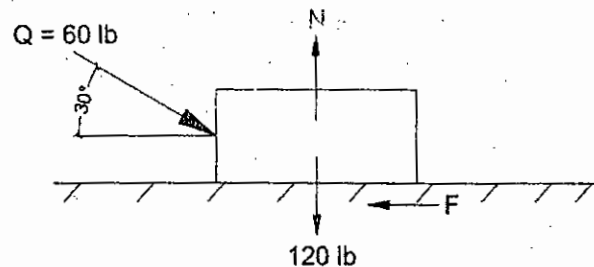
6. (a) Define second moment of inertia and polar moment of inertia. Prove that $k^2 = \bar{k}^2 + d^2$, where the symbols bear their usual meanings. (13)
- (b) Why basic concept of moment of inertia is significant? For the shaded area of the following figure: (i) Compute I_x and I_y . (22)



7. (a) What do you mean by work and power? Prove that $W_{net} = \Delta KE$, where the symbols bear their usual meanings. (10)
- (b) What is work done against gravity in lifting the material to its place during the building of a circular masonry chimney which is 350 ft high, 7m outside diameter and 5 m inside diameter? The masonry weighs 115 lb/ft³. (10)
- (c) A right circular cone of homogeneous material (as shown below) has a diameter D = 20 in., altitude, h = 30 in. A cylindrical hole, whose geometric axis is coincident with that of the cone, is bored in the base. This hole has a diameter, d = 8 in. and a depth, b = 6 in. Locate the center of gravity of the cone with the hole. (15)



8. (a) State the principle of linear impulse and momentum. Prove that, $R\Delta t = \Delta mv$, where the symbols bear their usual meanings. (10)
- (b) A 120 lb body is on a horizontal plane, where the co-efficient of kinetic friction, f = 0.15. A force of $Q = 60$ lb in figure. (i) What is the impulse of Q in the horizontal direction during 3 sec? (ii) What is the net impulse on the body during the same time? (10)



- (c) A jet of water A, whose velocity $V_A = 55$ fps, strikes a blade B, which is moving at $V_B = 20$ fps in the same direction as A, shown in figure. 7 lb/s of water strike the blade, half-passing without friction along the upper part and half-passing across the lower. What force in the y - direction is needed to prevent the movement of the blade in that direction? What is the horizontal thrust on the blade? (15)

