KATHMANDU UNIVERSITY
End Semester Examination [C]
May/June, 2019

Marks Scored:

Level : B.Arch.
Year : II
Course : ARCH 204
Semester : I
Exam Roll No. :
Time: 30 mins.
F. M. : 10
Registration No.:
Date : 31 MAY 2019

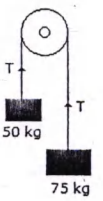
SECTION "A"
[20 Q. × 0.5 = 10 marks]

Encircle the most appropriate answer among the given choices.

1. Two forces act at an angle of 120°. If the greater force is 50 kg and their resultant is perpendicular to the smaller force, the smaller force is _____.
   a. 20 kg b. 25 kg c. 30 kg d. 35 kg

2. Pick up the incorrect statement from the following:
   a. The CG of a circle is at its center.
   b. The CG of a triangle is at the intersection of its medians.
   c. The CG of a rectangle is at the intersection of its diagonals.
   d. The CG of a semicircle is at a distance of r/2 from the center, where r is radius.

3. Two loads of 50 kg and 75 kg are hung at the ends of a rope passing over a smooth pulley shown in the figure. The tension in the string is _____.
   a. 50 kg b. 75 kg c. 25 kg d. 60 kg



4. The maximum pull in a cable, carrying a uniformly distributed load and supported at two ends which are at the same level, is at _____.
   a. supports b. quarter Span c. mid Span d. CG of the load

5. The ratio of the moment of inertia of a rectangle about its centroidal axis to the moment of inertia about its base is _____.
   a. ¼ b. ¾ c. ½ d. 2

6. A weight "W" is suspended at the free end of a light member hinged to a vertical wall. If the angle of inclination of the member with the upper wall is θ°, the force introduced in the member, is _____.
   a. W sec θ b. W cos θ c. W sin θ d. W cosec θ

7. The force polygon representing a set of forces in equilibrium is a _____.
   a. triangle b. open polygon c. closed polygon d. parallelogram

8. The force acting on a point on the surface of a rigid body may be considered to act
   a. at the center of gravity of the body
   b. on the periphery of the body
   c. on any point on the line of action of the force
   d. at any point on the surface normal to the line of action of the force

9. Parallelogram Law of forces states, "If two forces acting simultaneously on a particle be represented in magnitude and direction by two adjacent sides of a parallelogram, their resultant may be represented in magnitude and direction by _____."
   a. its longer side
   b. its shorter side
   c. the diagonal of the parallelogram which does not pass through the point of intersection of the forces
   d. the diagonal of the parallelogram which passes through the point of intersection of the forces

10. A point subjected to a number of forces will be in equilibrium, if _____.
    a. sum of resolved parts in any two directions at right angles, are both zero
    b. algebraic sum of the forces is zero
    c. two resolved parts in any two directions at right angles are equal
    d. algebraic sum of the moments of the forces about the point is zero

11. The center of gravity of a triangle is at the point where _____.
    a. medians of a triangle meet
    b. perpendicular bisectors of the sides of the triangle meet
    c. bisectors of the angle of the triangle meet
    d. $2/3^{rd}$ of the length of the side

12. Angle of friction is _____.
    a. the ratio of the friction and the normal reaction
    b. The force of friction when the body is in motion
    c. The angle between the normal reaction and the resultant of normal reaction and limiting friction
    d. The force of friction at which the body is just about to move

13. If a number of forces act simultaneously on a particle, it is possible _____.
    a. that the particle fails.
    b. to replace them by a single force
    c. to replace them by a single force through C.G.
    d. to replace them by a couple.

14. The product of force of couple with the arm of the couple is called _____.
    a. resultant couple
    b. resulting couple
    c. moment of the forces
    d. moment of the couple

15. The coefficient of friction depends on _____.
    a. area of contact
    b. shape of surfaces
    c. strength of surfaces
    d. nature of surfaces

16. If the bending of the beam is concave upwards then the bending moment developed is called _____ moment.
    a. positive b. negative c. rotational d. collinear

17. Which of the following end condition restricts displacement in only one direction?
    a. Hinged End b. Fixed end c. Roller end d. Free end

18. The maximum frictional force which comes into play when a body just begins to slide over another surface is called _____.
    a. limiting friction b. rolling friction c. sliding friction d. kinematic friction

19. Angle of repose is _____.
    a. less than angle of friction
    b. equal to angle of friction
    c. more than angle of friction
    d. equal to 90° minus angle of friction

20. The forces which meet at one point and have their lines of action in different planes are called _____.
    a. Coplanar non-concurrent forces
    c. Non-coplanar concurrent forces
    c. Non-coplanar non-current forces
    d. intersecting forces

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SECTION "B"

Attempt *ALL* questions. Assume data if necessary.

1. For the plane area shown in figure 1, determine: [8]
   i. The first moments with respect to x and y axes.
   ii. The location of the centroid.

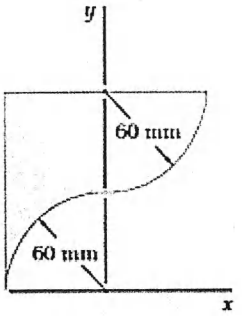

Figure 1

2. Determine the forces in members of the truss shown in figure 2. Show the values of forces in tabular form and state the nature of forces in each member. [8]

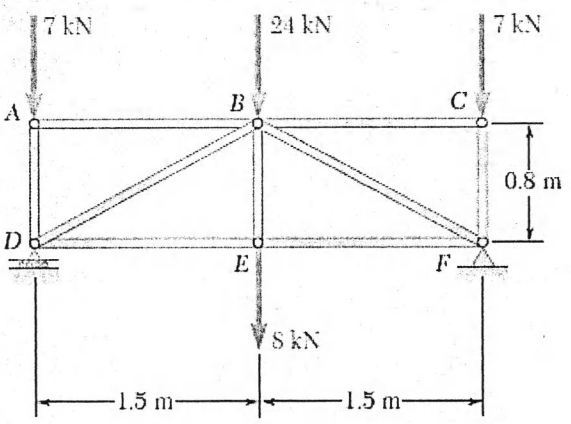

Figure 2

3. Draw the shear and bending moment diagrams with their values at significant points for the frame and loading shown in figure 3. What are the maximum values of shear force and bending moment and their location? [10]

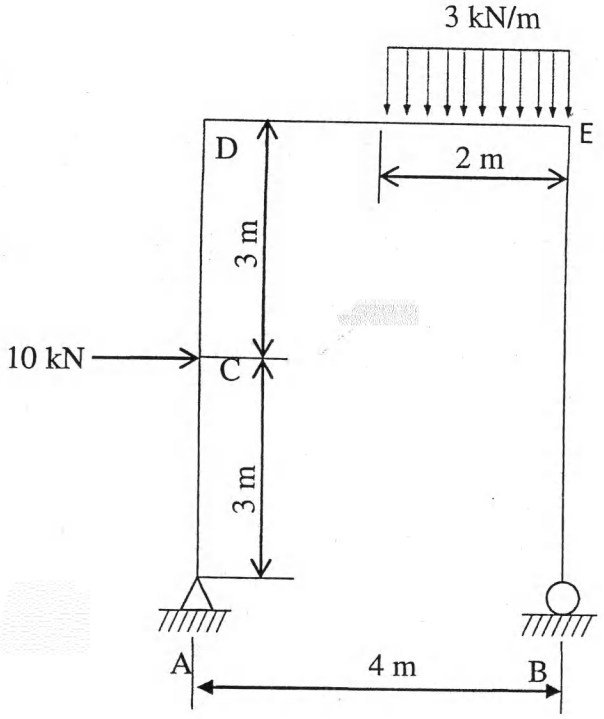

Figure 3

4. Two 80-N forces are applied as shown to the corners *B* and *D* of a rectangular plate. [4]

a. Determine the moment of the couple formed by the two forces by resolving each force into horizontal and vertical components.

b. Use the result obtained to determine the perpendicular distance between lines *BE* and *DF*. (Figure 4)

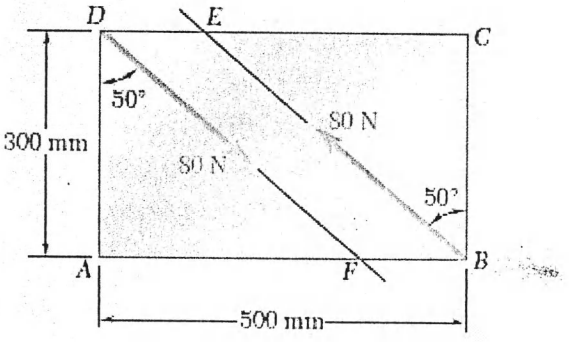

Figure 4

5. Determine *(a)* the x, y and z components of 600 N force *(b) the* angles θ_x, θ_y and θ_z that the force forms with the coordinate axes. (Refer figure 5) [4]

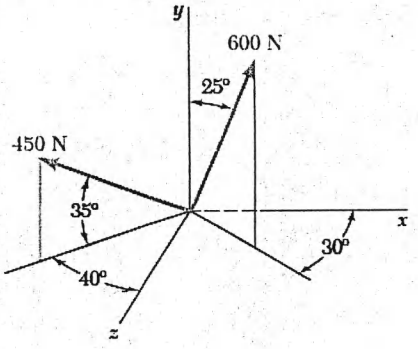

Figure 5

6. A 450N force acts as shown in figure 6, on a 1350N block placed on an inclined plane. The coefficients of friction between the block and the plane are $m_s = 0.25$ and $m_k = 0.20$. Determine whether the block is in equilibrium and find the value of friction force. [6]

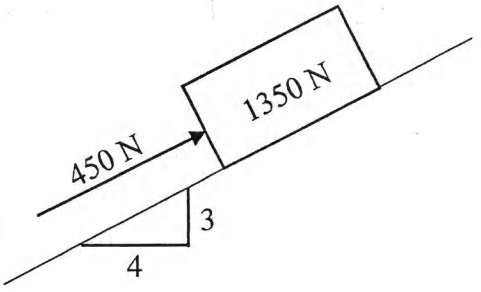

Figure 6