Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018

Level : B. E.
Year : II
Course : CIEG 203
Semester : I
Exam Roll No. :
Time: 30 mins.
F. M. : 10
Registration No.:
Date MAR: 19 2018

SECTION "A"
[20 Q × 0.5 = 10 marks]

Choose the most appropriate answer.

1. A heavy ladder resting on floor and against the vertical wall may not be in equilibrium, if
   a) The floor is smooth and wall is rough
   b) The floor is rough and wall is smooth
   c) The floor and wall both are smooth
   d) The floor and wall both are rough

2. A rigid body is acted upon by a couple. It undergoes
   a) translator rotation
   b) rotation
   c) plane motion
   d) translation

3. A projectile is projected horizontally from a height h. Its horizontal range is
   a) $\frac{u^2 \sin 2\alpha}{g}$
   b) $\frac{u^2}{2h}$
   c) $\frac{u^2}{2g}$
   d) $u\sqrt{\frac{2h}{g}}$

4. The centroidal moment of inertia of a slender rod having mass 'm' and length 'l' is given by?
   a) $\frac{ml^2}{2}$
   b) $\frac{ml^2}{4}$
   c) $\frac{ml^2}{6}$
   d) $\frac{ml^2}{12}$

5. For uniformly distributed load over the simply supported beam, the bending moment diagram at any section is
   a) Straight line
   b) Parabola
   c) Cubic Parabola
   d) Oblique straight line

6. The expression for Kinetic Energy in case of plane motion is given by?
   a) $\frac{m\bar{v}^2}{2}$
   b) $\frac{\bar{I}\omega^2}{2}$
   c) $\frac{m\bar{v}^2}{2}+\frac{\bar{I}\omega^2}{2}$
   d) $\frac{m\bar{v}^2}{2}+\bar{I}\omega^2$

7. The force required to move a body up an inclined plane will be least when the angle of inclination
   a) Equal to friction angle
   b) Greater than friction angle
   c) Less than friction angle
   d) Does not depend the angle of inclination

8. Which of the following is not a vector quantity
   a) Velocity
   b) Acceleration
   c) Force
   d) Weight

9. The algebraic sum of the moments of a coplanar force system is equal to the moment of the resultant about the same moment centre is
   a) Varignon's theorem
   b) law of resolution
   c) Newton's law
   d) D' Alembert theory

10. Support provides only vertical reactions and frictionless
   a) Roller
   b) Hinge
   c) Fixed
   d) combination of hinge and roller

11. The point through which resultant of the gravitational force acts for any orientation of the body
    a) Centre of mass
    b) Centre of gravity
    c) Centre of area of mass
    d) Centre of earth

12. Centroid applies for
    a) Bodies with mass and weight
    b) Plane figure have area only but no mass
    c) Plane figures have mass and weight
    d) Plane figures have mass and area

13. Shear Force is zero when the Bending moment
    a) Zero
    b) maximum
    c) constant
    d) minimum

14. The change of velocity of a particle or a body with respect to a certain fixed reference point is termed as
    a) Acceleration
    b) Velocity
    c) Displacement
    d) Constant acceleration

15. A force is acting on a mass of one kilogram and produces an acceleration of one meter per second square. Then the force is known
    a) Dyne
    b) Newton
    c) kg-weight
    d) kg

16. Spring constant is defined as
    a) Force required for unit deformation
    b) Unit force required for deformation
    c) Force required to stretch of spring
    d) Force required for maximum deformation

17. A vehicle having rectilinear motion moving with a velocity of 36 km/hr and accelerates uniformly to 72 km/hr over a distance of 200m. What would be the acceleration?
    a) 0.75 m/s^2
    b) 0.75 m/s^3
    c) 1.75 m/s^2
    d) 1.75 m/s^3

18. Moment of inertia of a rectangle of base (b) and height (h) about an axis
    a) $bh^3/4$
    b) $b^3h/16$
    c) $b^3h/12$
    d) $bh^3/12$

19. Free body diagram refers
    a) Isolated joints of the structure
    b) Isolated joints with all forces , including internal as well as external acting on it
    c) Showing only reactions of the structure
    d) Showing reactions and displacements without concerning the joint

20. In cantilever beam
    a) Deflection at the fixed end
    b) No deflection or rotation at the fixed end
    c) Maximum bending moment at the free end
    d) Maximum shear force at the free end

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SECTION "B"

Attempt *ALL* questions.

1. Draw Shear Force Diagram and Bending Moment Diagram for the beam shown in Figure. 1 and also locate the point of contraflexure. [10]

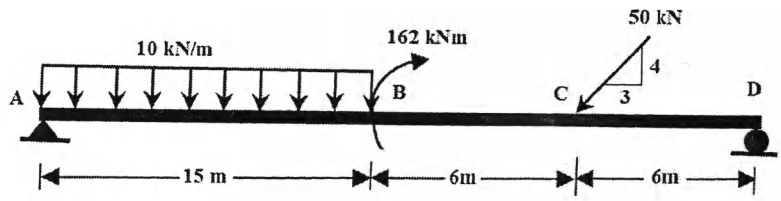

Figure 1

2. Determine the member forces of the given truss shown in Figure 2. Also State the nature of forces. (Show the results in tabular form).Draw clearly free body diagrams for each joints. [8]

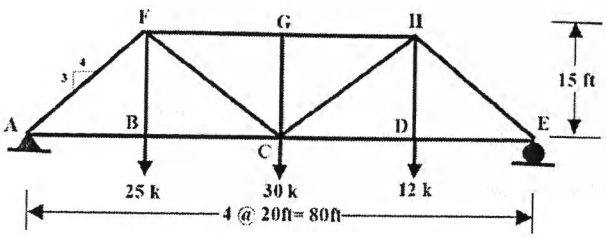

Figure 2

3. Determine the moment of inertia of the plane area shown in Figure 3, about its centroidal axis. [6]

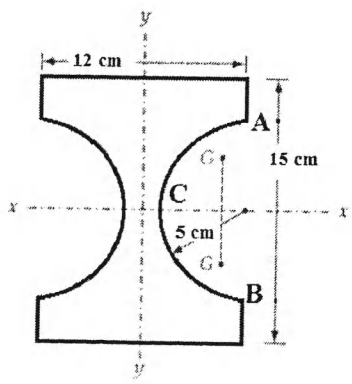

Figure 3

4. State laws of dry friction. A 30 kg block is dropped from a height of 2 m onto the 10 kg pan of a spring scale, shown in Figure 4. Assuming the impact to be perfectly plastic, determine the maximum deflection of the pan. The constant of the spring is K= 20 kN/m. Draw clearly free body diagram. [2+6]

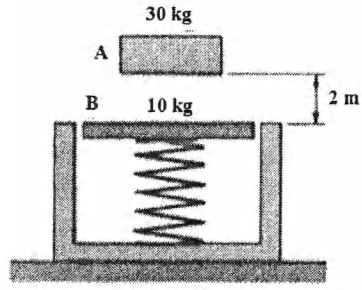

Figure 4

5. Define the General Plane Motion of Rigid Body, illustrate with example. A 20lb collar slides without friction along a vertical rod as shown in Figure 5. The spring attached to the collar has an undeformed length of 4 in. and a constant of 3 lb/in. if the collar is released from rest position 1, determine its velocity after it has moved 6 in. to position 2.Draw clearly free body diagram. [2+6]

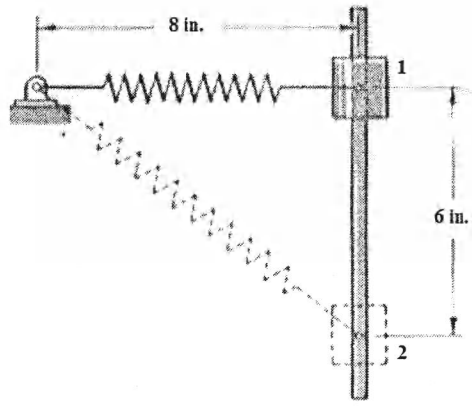

Figure 5