KATHMANDU UNIVERSITY
End Semester Examination
March/April 2017

Marks scored:

Level : B.E./B.Tech.
Year : II

Course : MEEG 216
Semester: I

Exam. Roll No.:

Time : 30 mins.

F.M. : 20

Registration No.:

Date APR 16 2017

SECTION "A"

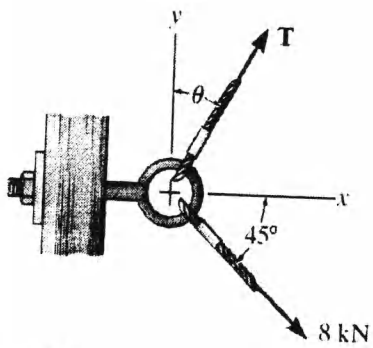
[20 Q.× 1 = 20 marks]

Tick the most appropriate answer.

Q 1. According to the principle of transmissibility of forces, the effect of a force upon a body is

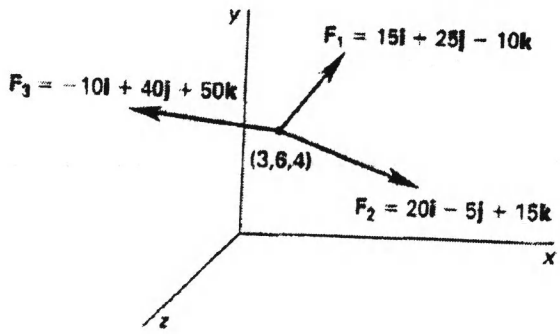
a. maximum when it acts at the center of gravity of a body
b. minimum when it acts at the center of gravity of a body
c. same at every point in its line of action
d. different at different points in its line of action

Q 2. If $\theta = 30^0$ and $T = 6\,kN$, and other force acting on the eye bolt is shown in Figure. What is the magnitude of resultant force?



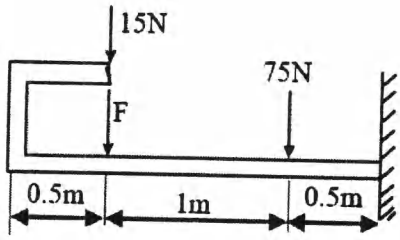
a. 7.67 kN b.8.67 kN c.9.67 kN d.10.67 kN

Q 3. What is the resultant 'R' of the system of forces shown?



a. $25i + 60j + 55k$
b. $10i + 40j + 50k$
c. $25i + 40j + 50k$
d. $25i + 55 + 40k$

Q 4. The loading shown requires a resisting moment of 20 N-m at the support. Calculate the value of the force 'F'.



a. 25.7 N b. 26.7 N c. 27.7 N d. 28 N

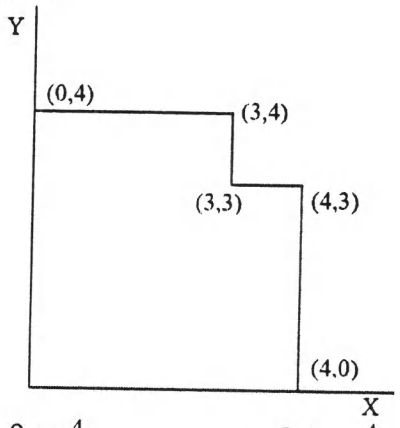
Q 5. For a two dimension truss structure, if m is the number of member 'j' is the number of joint, and r is the number of reactions, the condition for instability of the structure is

a. $m + r > 2j$ b. $m + r < 2j$ c. $m - r = 2j$ d. $m + 2r = 2j$

Q 6. The term second moment of area strictly applicable for

a. a line
b. any plane geometry Figure
c. both a line and any plane geometric Figure
d. volume element only.

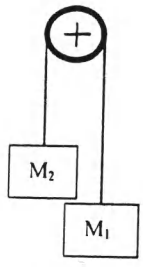
Q 7. The moment of inertia of a hollow circular, as shown in the Figure about an axis perpendicular to the section is



a. 1.7 cm^4 b. 1.9 cm^4 c. 2.1 cm^4 d. 2.3 cm^4

Q 8. If the $M_1 > M_2$, what is the correct expression of acceleration for M_2?

a. $a_2 = g \times \frac{W_1 - W_2}{W_1 + W_2}$
b. $a_2 = g \times \frac{W_1 + W_2}{W_1 + W_2}$
c. $a_2 = g \times \frac{W_1 - W_2}{W_1 - W_2}$
d. $a_2 = g \times \frac{W_1 + W_2}{W_1 + W_2}$



Q 9. When shear force at a point is zero, than bending moment at that point will be

a. maximum b. minimum c. zero d. infinity

Q 10. The point of contraflxure is a point where
a. bending moment is maximum
b. shear force changes sign
c. bending moment is maximum
d. bending moment changes sign

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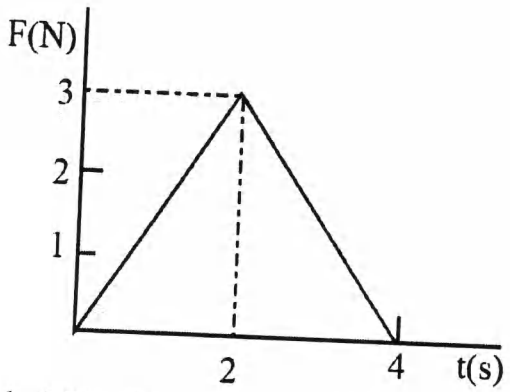
Q 11. The first derivative of kinetic energy with respect to time is
a. force b. momentum c. energy d. power

Q 12. A varying force acts on a 40 kg mass as shown in the following force versus time diagram. What is the object's velocity at t = 4 s if the object starts form rest?



a. 0 m/s b. 0.75 m/s c. 0.15 m/s d. 0. 30 m/s

Q 13. . For which of the following situations is the net force acting on a particle necessarily equal to zero?
a. the particle traveling at constant velocity around a circle
b. the particle has constant linear momentum
c. the particle has constant kinetic energy
d. the particle has constant angular momentum.

Q 14. Chose the equation that best represents a rigid body or particle under constant acceleration.
a. $a = 9.81\frac{m}{s^2} + \frac{V_0}{t}$
b. $V = V_0 + a_0\, t$
c. $V = V_0 + \int_0^t a\,(t)dt$
d. $a = \frac{v_t^2}{r}$

Q 15. A perfect sphere moves up a frictionless incline which of the following quantities increase?
a. angular velocity
b. total energy
c. potential Energy
d. linear momentum

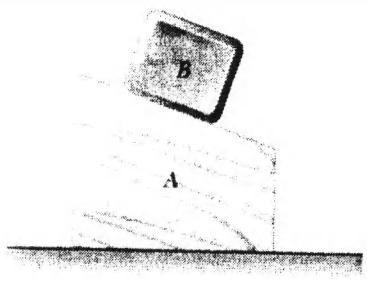
Q 16. The velocity (in m/s) of a falling Cricket ball is described by the equation $v = 32 + t + 6t^2$. What is the acceleration at time t =2 s.
a. 9.8 m/s^2 b. 19 m/s^2 c. 25 m/s^2 d. 31 m/s^2

Q 17. Constant acceleration implies
a. parabolic displacement diagram
b. linear displacement diagram
c. parabolic velocity diagram
d. quadratic velocity diagram

Q 18. Degree of freedom in a rigid body in motion is
a. zero
b. six
c. the total amount of linear displacement
d. the total number of possible modes of movement

Q 19. Generally the motion of a particle is described by
a. principle of work and energy alone
b. principle of Newton's law alone
c. principle of moments of momentum alone
d. principle of work and energy or impulse momentum of moment of momentum or Newton's Law

Q 20. The system shown is released from rest in the position shown. Neglecting friction, the normal force between block '*A*' and the ground is



a. less than the weight of *A* plus the weight of *B*
b. equal to the weight of *A* plus the weight of *B*
c. greater than the weight of *A* plus the weight of *B*
d. equal to the weight of A minus the weight of B

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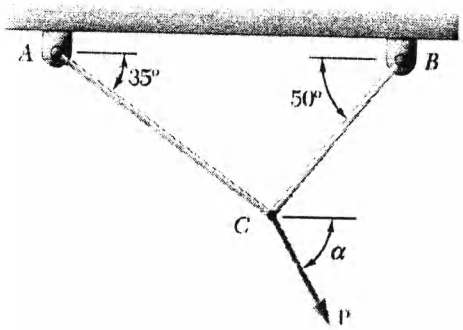
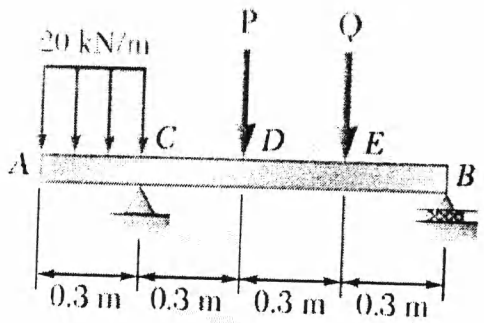
SECTION "B"

Attempt *ALL* questions.

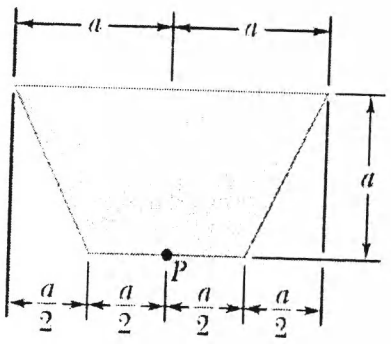
Q 1. Two cables tied together at *C* are loaded as shown. Knowing that the maximum allowable tension is 1200 N in cable *AC* and 600 N in cable *BC*, determine (*a*) the magnitude of the largest force P that can be applied at *C*, (*b*) the corresponding value of α. [3]



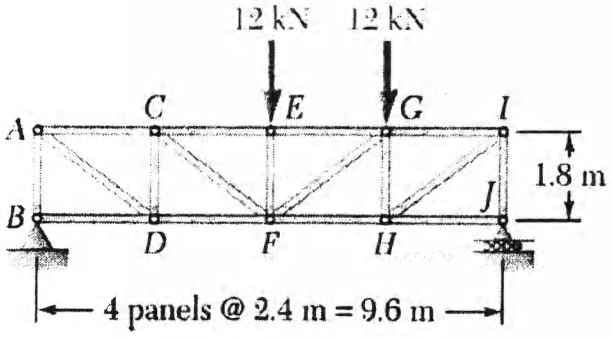
Q 2. The beam *AB* is subjected to the uniformly distributed load shown and to two unknown forces P and Q. Knowing that it has been experimentally determined that the bending moment is +800 Nm at *D* and +1300 Nm at *E*, (*a*) determine P and Q, (*b*) draw the shear and bending-moment diagrams for the beam. [8]



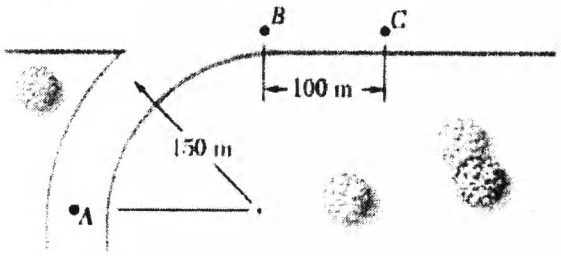
Q 3. Determine the polar moment of inertia of the shaded area shown with respect to point 'P'. [8]



Q 4. Determine the force in members *CD* and *DF* of the truss shown. [8]

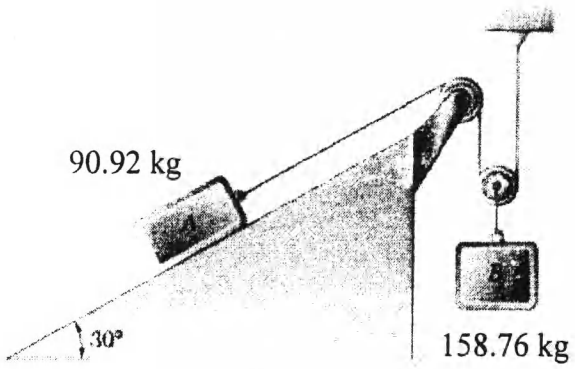


Q 5. A motorist starts from rest at Point *A* on a circular entrance ramp when $t = 0$, increases the speed of her automobile at a constant rate and enters the highway at Point *B*. Knowing that her speed continues to increase at the same rate until it reaches 100 km/h at Point *C*, determine (*a*) the speed at Point *B*, (*b*) the magnitude of the total acceleration when $t = 20$ s. [4]



Q 6. The motion of a particle is defined by the relation $x = 2t^3 - 15t^2 + 24t + 4$, where x and t are expressed in meters and seconds, respectively. Determine (*a*) when the velocity is zero, (*b*) the position and the total distance traveled when the acceleration is zero. [8]

Q 7. The two blocks shown are originally at rest. Assuming that the coefficients of friction between block 'A' and the incline are $\mu_s = 0.25$ and $\mu_k = 0.20$. Neglecting the masses of the pulleys and the effect of friction in the pulleys and between block '*A*' and the incline, determine (*a*) the acceleration of each block, (*b*) the tension in the cable. [8]



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Q 8. A spring is used to stop a 50 kg package which is moving down a 20 ^{0} incline. The spring has a constant k = 30 kN/m and is held by cables so that it is initially compressed 50 mm. Knowing that the velocity of the package is 2 m/s when it is 8 m from the spring and neglecting friction, assuming the kinetic coefficient of friction between the package and the incline is 0.2, determine the maximum additional deformation of the spring in bringing the package to rest. [8]