Marks scored:

KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2017

Level : B. E./B. Tech.
Year : II
Course : MEEG 216
Semester: I

Exam Roll No. :
Time: 30 mins.
F. M. : 20

Registration No.:
Date JUL 1 3 2017

SECTION "A"
[20 Q. × 1 = 20 marks]

Circle appropriate answers.

1. Analysis of the truss is important for the study
   a. Transverse load
   b. Normal stress
   c. Shear stress
   d. Shear and normal stress

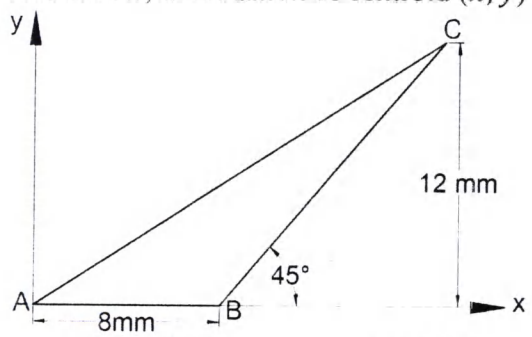
2. Which of the following is not the special application of the moment of Inertia
   a. Moment of force
   b. Deflection in cantilever beams
   c. Inertial force on a rectilinear motion
   d. Flywheel design

3. One end of a horizontal plank rests on aninclined surface inclined at 20°. The direction of the reaction force on the inclined surface is
   a. Parallel to the inclined plane
   b. Perpendicular to the inclined plane
   c. 20° with the plank
   d. Depends on the length of the plank

4. Centroid and center of mass lies in same position when
   a. The material is homogenous
   b. The material has uniformly varying density
   c. The geometry is quasi-two dimensional
   d. The gravity action on each particle is uniform

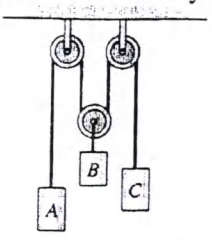
5. The moment of inertia of a thin spherical shell of mass 1 unit and radius 1 unit, about its diameter is
   a. 1/3
   b. 2/3
   c. 2/5
   d. 3/5

6. In the triangle ABC below, the location of centroid $(\bar{x}, \bar{y})$ is



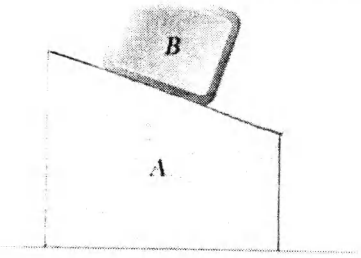
   a. (26/3,4)
   b. (27/3,4)
   c. (28/3,4)
   d. (29/3,4)

7. If block A is moving downwards at 6 m/s while black C is moving down at 18 m/s as shown in figure below. Then the relative velocity of block B with respect to C is



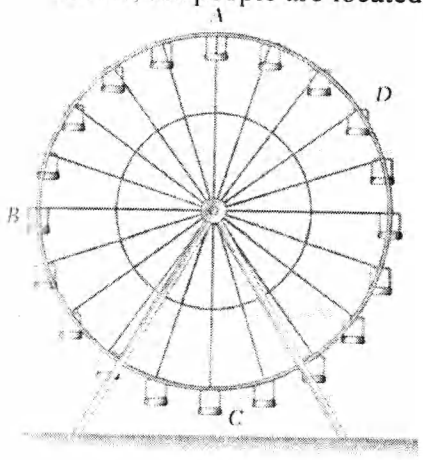
   a. 20 m/s
   b. 10 m/s
   c. 30 m/s
   d. 40 m/s

8. 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 the A

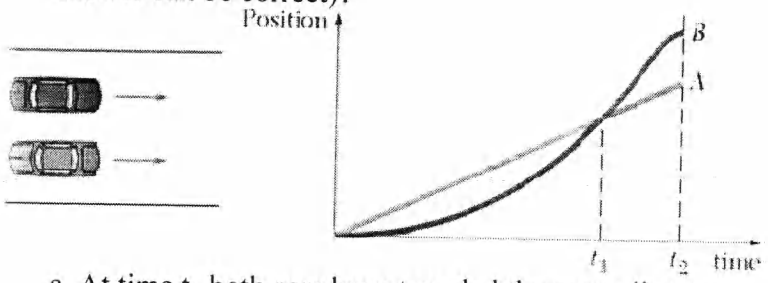
9. People sit on a Ferris wheel at Points A, B, C and D. The Ferris wheel travels at a constant angular velocity. At the instant shown, which person experiences the largest force from his or her chair (back and seat)? Assume you can neglect the size of the chairs, that is, the people are located the same distance from the axis of rotation.



a. A b. B c. C d. D

10. A 400-kg satellite was placed in a circular orbit 1500 km above the surface of the earth. At this elevation the acceleration of gravity is 6.43 m/s2. Determine the kinetic energy of the satellite, knowing that its orbital speed is 25.6 ×103 km/h.
a. 8.01 GJ b. 10.11 GJ c. 13.21 GJ d. 18.11 GJ

11. Two cars A and B race each other down a straight road. The position of each car as a function of time is shown. Which of the following statements are true (more than one answer can be correct)?



a. At time t_1 both cars have traveled the same distance
b. At time t_1 both cars have the same speed
c. Both cars have the same speed at some timet< t_1
d. Both cars have the same acceleration at some timet< t_1

12. Which of the following statement is correct?
a. The kinetic energy of a body before impact is equal to the kinetic energy of a body after impact
b. The kinetic energy of a body during impact remains constant
c. The kinetic energy of a body before impact is more than the kinetic energy of a body after impact
d. The kinetic energy of a body before impact is less than the kinetic energy of a body after impact

13. The total momentum of a system of masses (i. e. moving bodies) in any one direction remains constant, unless acted upon by an external force in that direction. This statement is called
a. Newton's first law of motion
b. Newton's second law of motion
c. Principle of conservation of momentum
d. Principle of conservation of energy

14. A particle has an initial speed 27 m/s. If it experiences a deceleration $a = -6m/s^2$, determine he distance travelled before it stops.
a. 50 m b. 52 m c. 54 m d. 56 m

15. The forces, which meet at one point, but their lines of action do not lie in a plane, are called
a. Coplanar non-concurrent forces
b. Non-coplanar non-concurrent forces
c. Non-coplanar concurrent forces
d. Intersecting forces

16. The motion of a wheel of a car is
a. Purely translation
b. Combined translation and rotational
c. Dependent to surface roughness
d. Purely rotational

17. If the resultant of two equal forces has the same magnitude as either of the forces, then the angle between the two forces is
a. 30° b. 60° c. 120° d. 150°

18. According to principle of transmissibility of forces, the effect of a force upon a body is
a. maximum when it acts at the C.G. of a body
b. the same at every point in its line of action
c. different at different points in its line of action
d. minimum when it acts at the C.G. of the body

19. For a cantilever beam of given length, resistance to the bending is dependents on
a. Location of centroid
b. Mass of the beam
c. Poissons ratio
d. Second moment of area

20. A cable with a uniformly distributed load per horizontal meter run will take the following shape
a. Straight line b. Parabola c. Hyperbola d. Elliptical

KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2017

JUL 1 3 2017

Level : B. E./B. Tech.
Year : II
Time : 2 hrs. 30 mins.

Course : MEEG 216
Semester: I
F. M. : 55

SECTION "B"

Attempt *ALL* the questions.

1. A welded connection is in equilibrium under the action of the four forces shown in figure 1. Knowing that F_A = 8 kN and F_B = 16 kN, determine the magnitude of the other two forces. [5]

2. A force P is applied to a bent rod ABC, which may be supported in four different ways as shown in figure 2. If possible, determine the reactions at the supports. [5]

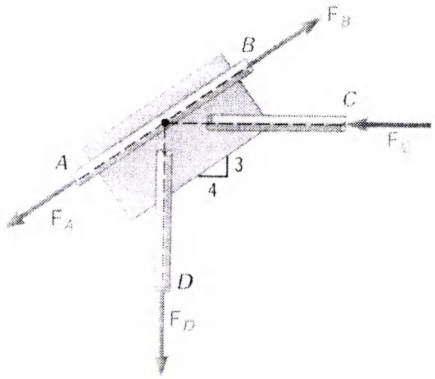


Figure 1

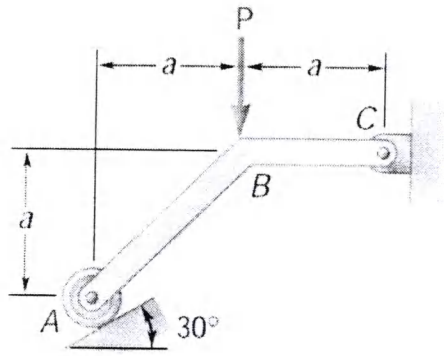


Figure 2

3. Determine by direct integration the centroid of the area shown in figure 3. [7]

4. Determine the moments of inertia I_x and I_y of the area shown in figure 4 with respect to centroidal axes respectively parallel and perpendicular to side AB. [6]

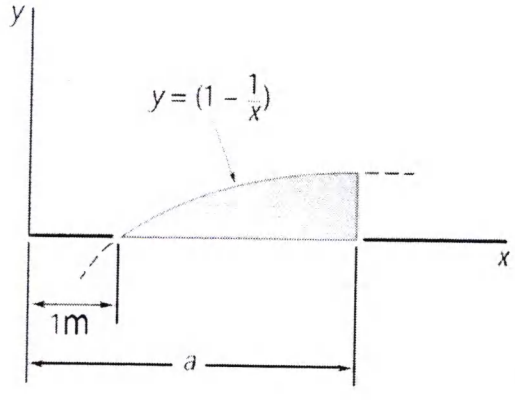


Figure 3

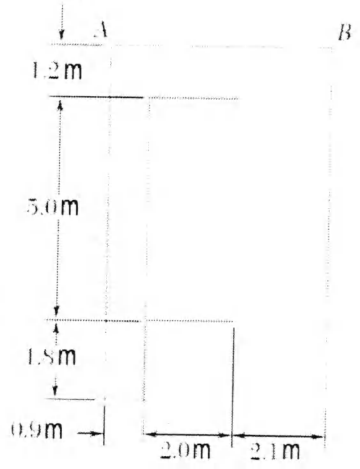


Figure 4

5. Determine the force in each member of the Pratt bridge truss shown in figure 5. Calculate the forces in member CE and BE. Also state if these members are in tension or compression. [8]

6. For the beam and loading shown in figure 6, (a) draw the shear and bending-moment diagrams; (b) determine the maximum absolute values of the shear and bending moment. [8]

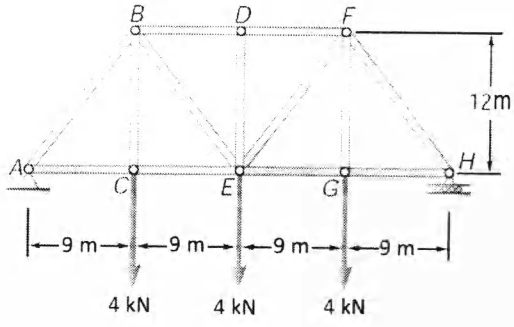


Figure 5

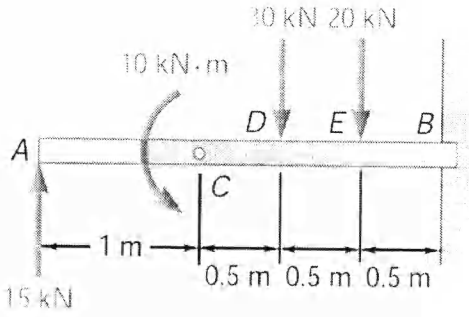


Figure 6

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

8. A 50 N collar slides without friction along a vertical rod as shown in figure 8. The spring attached to the collar has an undeformed length of 4 m. and a constant of 15 N/m. If the collar is released from rest in position 1, determine its velocity after it has moved 6 m. to position 2. [8]

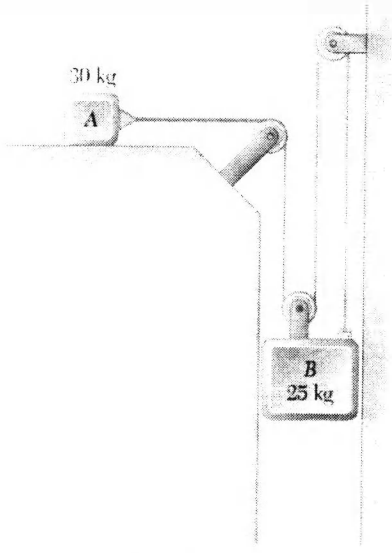


Figure 7

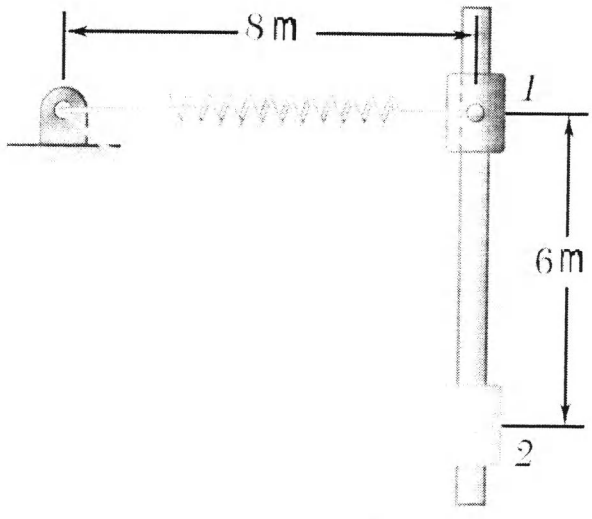


Figure 8