

Marks scored:

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

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

Course : MEEG 216
Semester : I

Exam Roll No. : Time: 30 mins.

F. M. : 20

Registration No.:

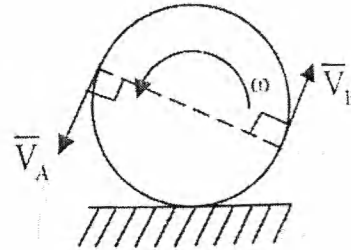
Date 07 JUN 2019

SECTION "A"
[20Q. x 1= 20 marks]

Cross [X] mark the most appropriate answer.

- The friction experienced by a body when in motion is called
 Rolling friction Kinetic friction Limiting friction Static friction
- The product of inertia can be a) positive, b) negative c) zero
 Choose the option that best describes the above condition
 both a and b only c all a, b, c only b and c
- A and B are the end points of a diameter of a disc rolling along a straight line with a counter clockwise angular velocity as shown in the figure. Referring to the velocity vectors \vec{V}_A and \vec{V}_B shown in the figure.

- \vec{V}_A and \vec{V}_B are both correct
- \vec{V}_A and \vec{V}_B are both incorrect
- \vec{V}_A is incorrect but \vec{V}_B is correct
- \vec{V}_A is correct and \vec{V}_B is incorrect.



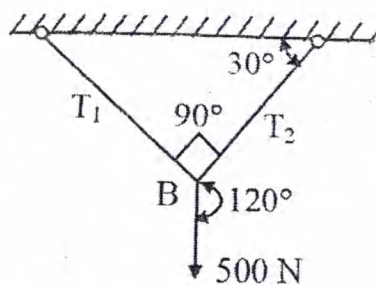
- A ball A of mass 'm' falls under gravity from a height 'h' and strikes another ball B of mass 'm' which is supported at rest on a spring of stiffness 'k'. Assume perfect elastic impact. Immediately after impact
 The velocity of ball A is $\frac{1}{2}\sqrt{2gh}$ The velocity of ball A is zero
 The velocity of both balls are $\frac{1}{2}\sqrt{2gh}$ the velocity of ball A is $\sqrt{2gh}$
- Consider a hexagon is made up of 6 individual different parts where density of all parts is ρ_1 . Now one of the parts of the hexagon is removed and material with density ρ_2 is inserted. Which of the following conditions hold true?
 Center of mass and centroid both changes
 Centroid changes and center of mass remains the same
 Centroid remains same and center of mass changes
 Both center of mass and centroid remain same.

6. A mass m_1 of 100 kg travelling with a uniform velocity of 5 m/s along a line collides with a stationary mass m_2 of 1000 kg. After the collision, both the masses travel together with the same velocity. The coefficient of restitution is
 0.6 0.1 0.01 0

7. A car moving with uniform acceleration covers 450 m in a 5 second interval, and covers 700 m in next 5 second interval. The acceleration of the car is
 7 m/s^2 50 m/s^2 25 m/s^2 10 m/s^2

8. In a statically determinate plane truss, the number of joints (j) and the number of members (m) are related by
 $j = 2m - 3$ $m = 2j + 1$ $m = 2j - 3$ $m = 2j - 1$

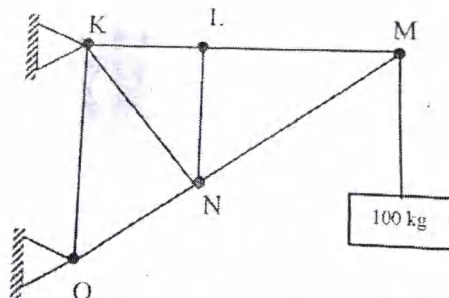
9. A weight of 500 N is supported by two metallic ropes as shown in the figure. The values of tensions T_1 and T_2 are respectively.
 433 N and 250 N
 250 N and 433 N
 353.3 N and 250 N
 250 N and 353.5 N



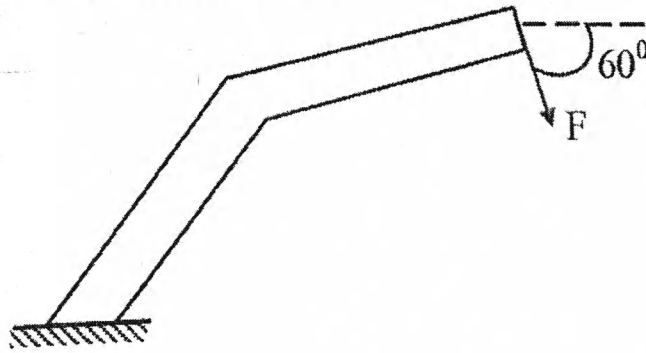
10. The time variation of the position of a particle in rectilinear motion is given by $x = 2t^3 + t^2 + 2t$. If 'V' is the velocity and 'a' is the acceleration of the particle in consistent units, the motion started with
 $V = 0$ and $a = 0$ $V = 0$ and $a = 2$ $V = 2$ and $a = 0$ $V = 2$ and $a = 2$

11. Four forces F_1, F_2, F_3 and F_4 are acting on a rigid body such that they are concurrent in nature. For a rigid body, which of the following conditions is enough to be in equilibrium?
 $\sum F = 0$ and $\sum M = 0$ $\sum M = 0$
 $\sum F = 0$ $\sum F = 0$ and $\sum M \neq 0$

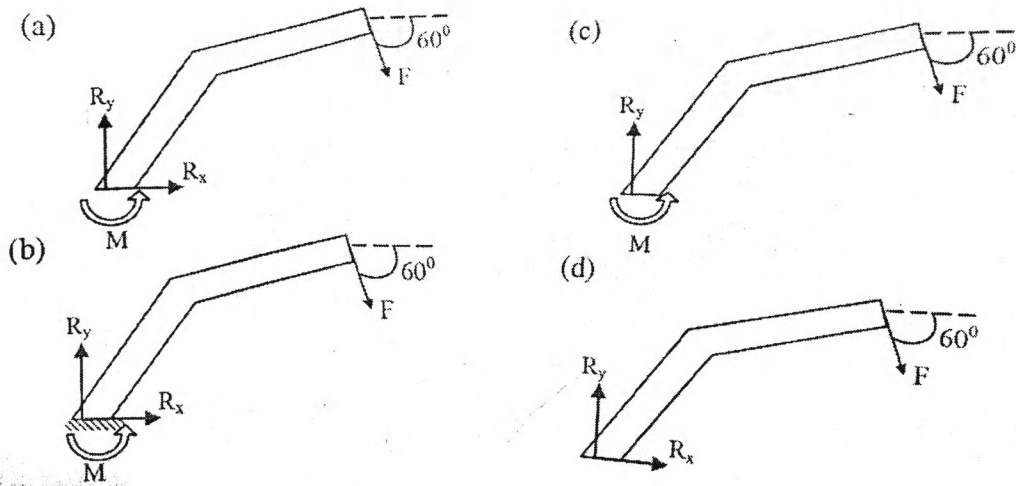
12. The figure shows a pin jointed plane truss loaded at the point M by hanging a mass of 100 kg. The member LN of the truss is subjected to a load of
 Zero
 490 N in compression
 981 N in compression
 981 N in tension



13. The equations described are
 a) $v = v_0 + at$ b) $x = x_0 + v_0t + \frac{1}{2}at^2$ c) $x = x_0 + vt$
 Which of the following is true for a particle moving with a constant acceleration 'a'?
 Both a and b Only c All a, b, c Only b
14. The first derivative of kinetic energy with respect to time is
 Force Momentum Energy Power
15. The unit of impact is (N= Newton, Kg = kilogram, m = meter, s = second)
 N-s Kg-m Kg-s m/s
16. A force 'F' is acting on a bent bar which is clamped at one end is shown in the figure.



The correct free body diagram is



a

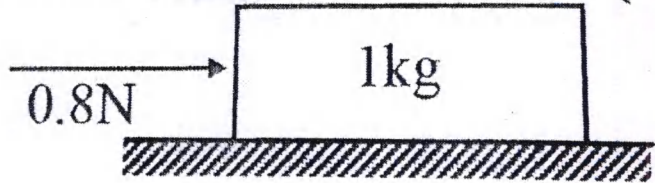
b

c

d

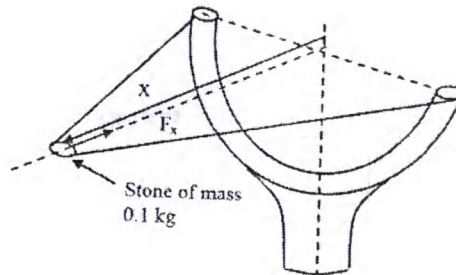
17. A 1 kg of block is resting on a surface with coefficient of friction $\mu = 0.1$. A force of 0.8N is applied to the block as shown in the figure. The friction force is

- zero
 0.8N
 0.89N
 1.2 N



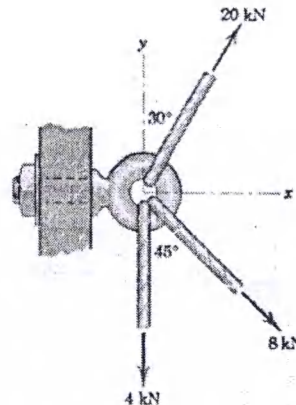
18. A stone with mass of 0.1 kg is catapulted as shown in the figure. The total force F_x (in N) exerted by rubber band as a function of distance x (in m) is given by $F_x = 3000x^2$. If the stone is displaced by 0.1m from the un-stretched position ($x=0$) of the rubber band, the energy stored in the rubber band is

- 0.01 J
 0.1 J
 1 J
 10 J



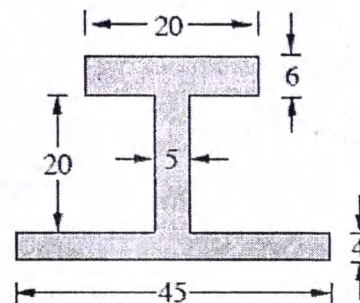
19. Determine the value of the resultant R of the three tension forces acting on an eye bolt shown.

- 17.43 kN
 35.42 kN
 38.63kN
 16.23 kN



20. The centroid of the following figure is. The dimensions are in 'mm'.

- 12.5 mm
 13.5 mm
 11 mm
 11.5 mm



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F. M. : 55

SECTION "B"

Attempt ALL questions. Assume suitable data if missing.

1.

- a) A loading car is at rest on a track forming an angle of 25° with the vertical. The gross weight of the car and its load is 5500 lb. and it acts at a point of 30 in. from the track, halfway between the two axles. The car is held by a cable attached 24 in. from the track. Determine the tensions in the cable and reaction at each pair of wheels. [4]

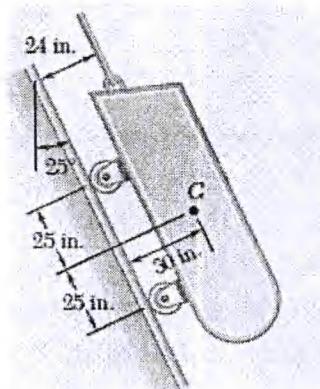


Figure 1

- b) Determine the moment of the force 500 about point O. [3]

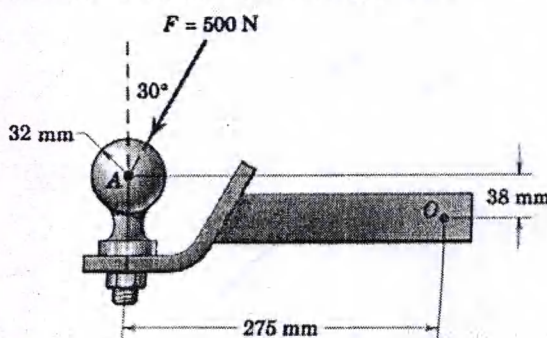


Figure 2

2.

- a) Determine the range of values which the mass m_0 may have so that the 100-kg block shown in the figure will neither start moving up the plane nor slip down the plane. The coefficient of static friction between the contact surfaces is 0.30. [4]

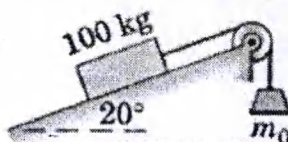


Figure 3

- b) A block R of mass 100 kg is placed on a block S of mass 100 kg as shown in the figure. Block R is tied to the wall by a massless and inextensible spring PQ. If the coefficient of static friction for all surfaces is 0.4, find the minimum force F (in kN) needed to move the block S. [4]

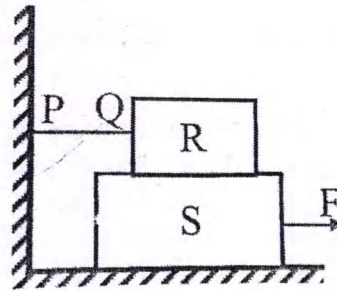


Figure 4

3. Compute the force in each member of the loaded cantilever truss by the method of joints. [8]

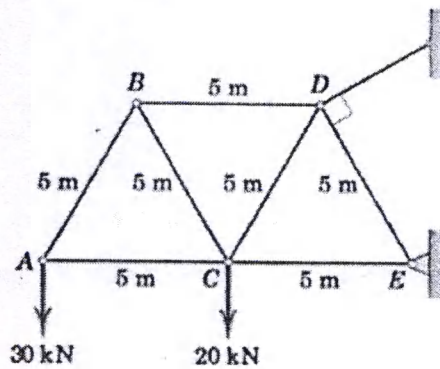


Figure 5

4. Determine the moment of inertia of the following figure with respect to x and y coordinates. The dimensions are in 'mm'. [8]

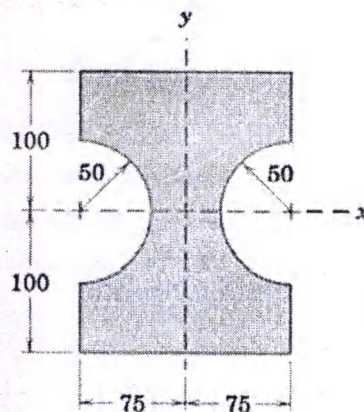


Figure 6

5. Determine the reactions at A and B. [5]

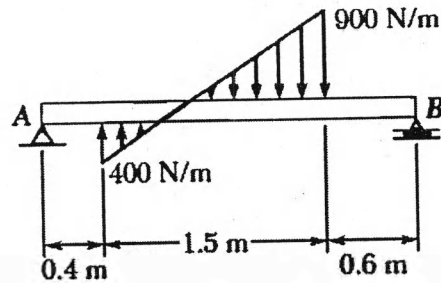


Figure 7

6. A hammer and a punch are used by a surgeon when inserting a hip implant. To better understand this process, an instrumented implant is inserted into a fixed replicate femur. The upward resisting force from the replicate femur on the hip implant can be neglected during the impact and the impact force from the punch can be approximated by a half sine wave. Determine the speed of the 0.3 kg implant immediately after impact. [4]

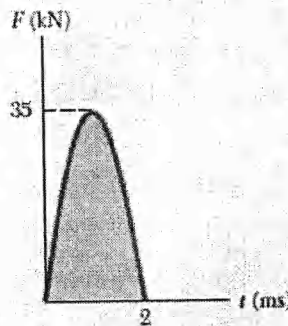


Figure 8

7. An uncontrolled automobile travelling at 66 m/s strikes a highway crash barrier square on. After initially hitting a barrier, the automobile decelerates at a rate proportional to the distance x the automobile has moved into the barrier; specifically, $a = -60\sqrt{x}$ where a and x are expressed in m/s^2 and m respectively. Determine the distance the automobile will move into the barrier before it comes to rest. (figure just for representation only). [4]

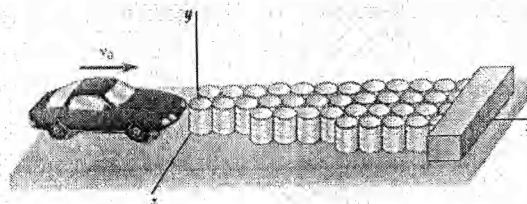


Figure 9

8. Race car A is travelling on a straight portion of the track while race car B is travelling on a circular portion of the track. At the instant shown, the speed of A is increasing at the rate of 10 m/s^2 and the speed of B is decreasing at the rate of 6 m/s^2 . For the positions shown, determine a) velocity of B relative to A., b) acceleration of B relative to A. [6]

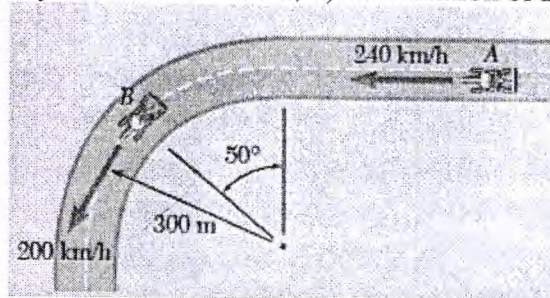


Figure 10

9. Determine the centroid of the figure 11. [5]

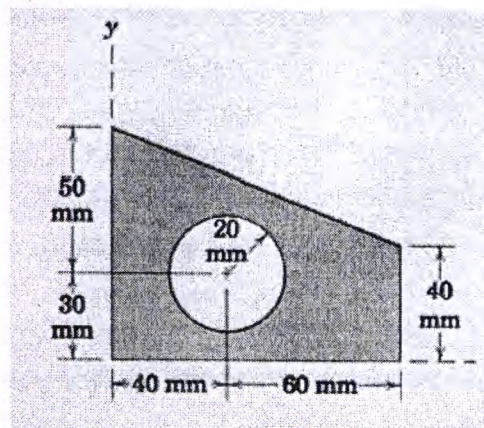


Figure 11

KATHMANDU UNIVERSITY
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Level : B.E.
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Semester: I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date 9-7 JUN 2019

SECTION "A"

[20Q. × 0.5 = 10 marks]

Encircle the most appropriate answer among the given choices.

1. Bad ranging is a type of
a) negative cumulative error b) positive cumulative error
c) compensating error d) accidental error
2. The variation in magnetic declination at a place caused due to rotation of earth about sun is termed as
a) Daily variation b) Diurnal variation
c) Annual variation d) Seasonal variation
3. The line joining points having zero declination angle is termed as
a) agonic line b) isogonic line c) contour line d) isoclinic line
4. In a well-conditioned triangle no angle should be less than
a) 15° b) 30° c) 45° d) 60°
5. Which of the following scale is the large scale?
a) 1cm = 1km b) 1cm = 100m c) 1cm = 10m d) 1cm = 1m
6. The equipment used for marking the end of chain length when line to be measured is more than chain length is termed as
a) arrow b) peg c) plumb bob d) cross staff
7. The main survey stations are located on the ground by
a) index sketch b) line sketch c) reference sketch d) rough sketch
8. The main objective of plane surveying is to prepare
a) network of triangles b) X-section
c) L-section d) map
9. Astronomical meridians
a) converge at a point called pole b) converge near equator
c) are parallel to each other d) are parallel to magnetic meridians
10. The following sights are taken at turning point
a) BS and IS b) IS and FS c) BS and FS d) FS only

11. The following readings were taken on a uniformly sloping ground: 1.3, 1.8, 2.8, 0.6, 1.1, 1.6, 2.1. Hence the difference in level between the last and first station is
a) 3.0 fall b) 3.0 rise c) 0.80 fall d) 0.80 rise
12. Line ranger consists of
a) two mirrors inclined at 45° to each other
b) two equilateral triangular prism placed one above another
c) two right angle isosceles triangular prism placed one above other
d) two right angle isosceles triangular prism with silvered diagonal faces placed one above other
13. The rise and fall method of computing RL provides a complete check on
a) BS and FS only b) BS and IS only c) BS, IS and FS d) IS and FS only
14. Orientation of plane table by back sighting is done using
a) trough compass b) alidate c) U fork d) spirit level
15. Single line or Double line field book is used during
a) triangulation surveying b) cadastral surveying
c) chain surveying d) topographical surveying
16. ABCD is a rectangle. Bearing of AB = 50° . Hence bearing of DC is
a) 320° b) 230° c) 140° d) 50°
17. Precision is a term which indicates the degree of conformity of
a) measured value to its true value
b) measured value to its mean value
c) measured values to each other
d) measured value to its weighted mean value
18. The U fork or plumbing fork is required during
a) resection b) radiation c) orientation d) centering
19. The included angle while theodolite traversing, are generally measured
a) clockwise from forward station b) clockwise from back station
c) anticlockwise from forward station d) anticlockwise from back station
20. The axis about which the telescope along which the vertical circle of a theodolite may be rotated in vertical plane is known as
a) horizontal axis b) vertical axis c) axis of telescope d) line of collimation

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F. M. : 40

SECTION "B"

[4Q. × 4 = 16 marks]

Attempt *ANY FOUR* questions.

1. Define plane table surveying. List out the various temporary adjustments to be performed while doing plane table surveying. Explain any two methods of plane table surveying in detail with figures. [1+1+2]
2. A river is flowing from west to east. For determining the width of the river, two points A and B are selected on the southern bank such that distance AB is 100 m. Point A is west wards. The bearing of a tree on opposite bank are observed to be 40° and 340° respectively from A and B. Calculate the width of the river. [4]
3. The levelling was done between stations M and Z, starting with back sight at M. Various back sights taken were in the following sequence: 1.3, 2.3, -0.6, -1.6 and X. The sum of all the fore sights was found to be 3.5. Also, it was known that Z is 0.5 m lower than M. Find the value of X. How many fore sights do you expect? [4]
4. Differentiate between (*ANY TWO*): [2 × 2 = 4]
 - a) Topographical map and Cadastral map
 - b) Azimuth and Bearing
 - c) Swinging and Transiting
5. Write short notes on (*ANY TWO*): [2 × 2 = 4]
 - a) Prolongation of a line using theodolite
 - b) Three screw method of levelling
 - c) Shrunk scale

SECTION "C"

[4Q. × 6 = 24 marks]

Attempt *ANY FOUR* questions.

6. Define closing error. The fore and back bearings of a closed traverse are given below. Indicate which stations are affected by local attraction. Also, find out the corrected bearings. If the value of declination is 4° W, find out the true bearings. [1+5]

Line	F.B	B.B
AB	S $55^\circ 30'$ E	N $55^\circ 30'$ W
BC	N $68^\circ 15'$ E	S $66^\circ 00'$ W
CD	N $49^\circ 30'$ W	S $44^\circ 45'$ E
DA	S $20^\circ 15'$ W	N $17^\circ 45'$ E

7. Explain the use of arrow. A 2 km long line is measured with a tape of length 50 m which is standardized under no pull at 15 °C. The tape has cross-sectional area of 3.75 mm². If one half of the line is measured at temperature of 20 °C and the other half at 26 °C and the tape is stretched with a pull of 22 kg, find the corrected total length, given that the coefficient of expansion is 12 X 10⁻⁶ per °C, weight of 1 cm³ of steel = 7.750 g and E = 2.11 X 10⁶ kg/cm². [1+5]
8. Define surveying and classify it on different basis. What are the sources of error in theodolite surveying? [3+3]
9. Describe the different methods of setting out a right angle at a point on a chain line using a chain/tape only. List out the instruments used for setting right angles. Explain the use of any one instrument with figure. [3+1+2]
10. The following is the page of a level field book. Fill in the missing readings and calculate the R.L's of all points. Check the accuracy of calculations. [6]

Station	B.S	I.S	F.S	Rise	Fall	R.L, m	Remarks
1	3.250						
2	1.880		?		0.600		
3		2.250			?		
4	?		1.920	?			
5		2.540			0.015		
6	?		?	1.000			
7	1.175		2.115		?	225.305	
8		1.625			?		
9	?		1.895		0.270		
10			1.255		0.750		
Sum	11.450						