

**LOVELY PROFESSIONAL UNIVERSITY**  
**BASIC ENGINEERING MECHANICS**  
**MCQ TUTORIAL SHEET OF MEC 107**

**1. Concurrent forces are those forces whose lines of action**

1. Meet on the same plane    2. Meet at one point    3. Lie on the same line  
4. None of these

**2. Which of the following is a scalar quantity?**

1. Force    2. Velocity    3. Speed    4.  
Acceleration

**3. The principle of transmissibility of forces states that, when a force acts upon a body, its effect is**

1. Same at every point on its line of action  
2. Different at different points on its line of action  
3. Maximum, if it acts at the centre of gravity of the body  
4. Minimum, if it acts at the centre of gravity of the body

**4. Non-coplaner concurrent forces are those forces which**

1. Meet at one point and their lines of action also lie on the same plane  
2. Do not meet at one point and their lines of action do not lie on the same plane  
3. Meet at one point, but their lines of action do not lie on the same plane  
4. Do not meet at one point, but their lines of action lie on the same plane

**5. If a number of forces are acting at a point, their resultant will be inclined at an angle  $\theta$  with the horizontal, such that**

1.  $\tan \theta = \sum H / \sum V$     2.  $\tan \theta = \sum V / \sum H$     3.  $\tan \theta = \sum V \times \sum H$

**6. Which of the following are vector quantities?**

- 1. Linear displacement
- 2. Linear velocity
- 3. Linear acceleration
- 4. All of these

**7. The motion of a particle round a fixed axis is**

- 1. Rotary
- 2. Translator
- 3. Circular
- 4. translatory as well as rotary

**8. According to the law of moments, if a number of coplaner forces acting on a particle are in equilibrium, then**

- 1. Their lines of action are at equal distances
- 2. The algebraic sum of their moments about any point in their plane is zero
- 3. Their algebraic sum is zero
- 4. The algebraic sum of their moments about any point is equal to the moment of their resultant force about the same point.

**9. The rate of change of momentum is directly proportional to the impressed force, and takes place in the same direction in which the force acts. This statement is known as**

- 1. Newton's third law of motion
- 2. Newton's first law of motion
- 3. Newton's second law of motion
- 4. None of these

**10. A couple produces**

- 1. Combined translatory and rotational motion
- 2. Rotational motion
- 3. translatory motion
- 4. None of the above

**11. The unit of MOMENT in S.I units is**

- 1. kg-m
- 2. Newton
- 3. Joule
- 4. N-m

**12. Varingon's theorem of moments states that if a number of coplaner forces acting on a particle are in equilibrium, then**

1. The algebraic sum of their moments about any point in their plane is zero
2. Their lines of action are at equal distances
3. Their algebraic sum is zero
4. The algebraic sum of their moments about any point is equal to the moment of their resultant force about the same point.

**13. The resultant of the two forces P and Q is R. If Q is doubled, the new resultant is perpendicular to P. Then**

1.  $Q = R$       2. None of these      3.  $Q = 2R$       4.  $P = Q$

**14. The forces, which meet at one point and their lines of action also lie on the same plane, are known as**

1. Coplanar non-concurrent forces      2. Coplanar concurrent forces  
3. Non-coplanar non-concurrent forces      4. Non-coplanar concurrent forces

**15. The moment of a force**

1. is the turning effect produced by a force, on the body, on which it acts
2. is equal to the product of force acting on the body and the perpendicular distance of a point and the line of action of the force
3. is equal to twice the area of the triangle, whose base is the line representing the force and whose vertex is the point, about which the moment is taken
4. all of the above

**16. The matter contained in a body, is called**

1. Mass      2. Weight      3. Momentum      4. Impulsive force

**17. According to lami's theorem**

1. the three forces must be equal
2. the three forces must be at  $120^\circ$  to each other
3. the three forces must be in equilibrium
4. if the three forces acting at a point are in equilibrium, then each force is proportional to the sine of the angle between the other two

**18. If P is the force acting on the body, m is the mass of the body and a is the acceleration of the body, then according to Newton's second law of motion,**

1.  $P \times m.a = 0$
2.  $P - m.a = 0$
3.  $P/m.a = 0$
4.  $P + m.a = 0$

**19. The unit of force in S.I. system of units is**

1. Watt
2. Newton
- 3 kilogram
4. Dyne

**20. The three forces of 100 N, 200 N and 300 N have their lines of action parallel to each other but act in the opposite directions. These forces are known as**

1. coplaner non-concurrent forces
2. coplaner concurrent forces
3. like parallel forces
4. unlike parallel forces

**21. A number of forces acting at a point will be in equilibrium, if**

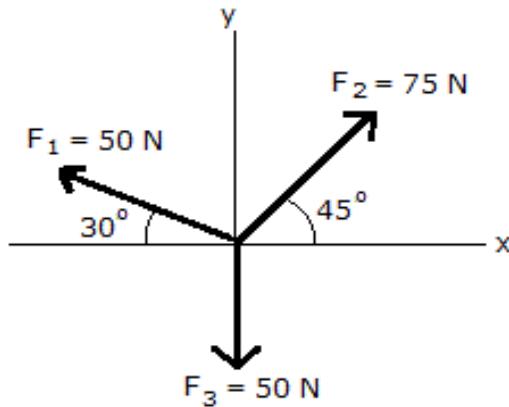
1. sum of all the forces is zero
2. sum of resolved parts in the vertical direction is zero (i.e.  $\sum V = 0$ )
3. all the forces are equally inclined
4. none of these

**22. Two forces are acting at an angle of  $120^\circ$ . The bigger force is 40N and the resultant is perpendicular to the smaller one. The smaller force is**

1. 40 N      2. 20 N      3. 30 N      4. none of these

**23. Determine the magnitude of the resultant force by adding the rectangular components of the three forces. (Fig )**

1.  $R = 29.7 \text{ N}$       2.  $R = 54.2 \text{ N}$       3.  $R = 90.8 \text{ N}$       4.  $R = 24.0 \text{ N}$



**28. The term 'force' may be defined as an agent which produces or tends to produce, destroys or tends to destroy motion.**

1. Agree      2. Disagree

**29. If the resultant of two equal forces has the same magnitude as either of the forces, then the angle between the two forces is**

1.  $30^\circ$       2.  $60^\circ$       3.  $90^\circ$       4.  $120^\circ$

**30.** The triangle law of forces states that if two forces acting simultaneously on a particle, be represented in magnitude and direction by the two sides of a triangle taken in order, then their resultant may be represented in magnitude and direction by the third side of a triangle, taken in opposite order



**31. The angle between two forces when the resultant is maximum and minimum respectively are**

- $1.0^\circ$  and  $180^\circ$

- $2.180^\circ$  and  $0^\circ$

- $3.90^\circ$  and  $180^\circ$

- $4.90^\circ$  and  $0^\circ$

**32. A resultant force is a single force which produces the same effect as produced by all the given forces acting on a body.**

## **EQUILIBRIUM OF FORCES IN 2D AND 3D**

**Q1** What do you mean by equilibrium

- a) The condition when there is no translational motion
- b) The condition when there is no rotational motion
- c) The condition when there is translational and rotational motion
- d) The condition when there is no translational and rotational motion

**Q2** The examples of equilibrium are

- a) Rotation of fan
- b) Motion of wheel
- c) Book resting on table and table is stationary
- d) Book resting on table but table moving.

**Q3** In equilibrium

- a) Sum of all forces in x direction and z direction and moment about any axis is zero
- b) Sum of all forces and moment in any direction is zero
- c) Sum of all forces is zero but moment is not zero
- d) Sum of all moments are zero but net forces not zero

**Q4** Use of equilibrium condition is

- a) To find the unknown moments
- b) To find the unknown forces
- c) To find the unknown forces and moments
- d) To find the unknown forces and moments to constrain the motion

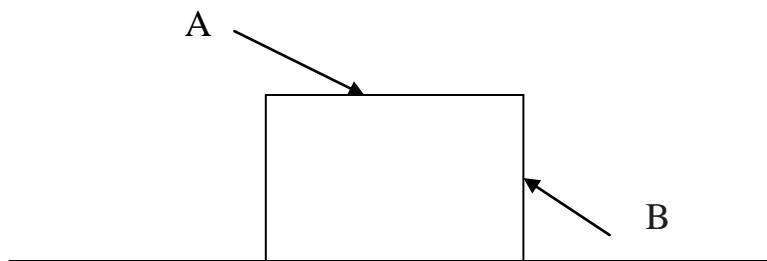
**Q5** To solve the problems of equilibrium what is necessary

- a) To draw the FBD
- b) To write the equations of equilibrium then solve them
- c) To draw the fbd and solving the equations of equilibrium
- d) To solve the equations without drawing the FBD

Q6 If on a body a force of 1500N is acting at an angle of 60 degree how much force in X direction must be act to stop the motion in x direction

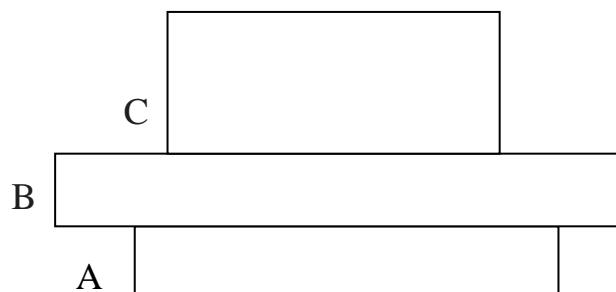
- a) 75000000dyne
- b) 1299 N
- c) 75 N
- d) 0N

Q7 For the diagram shown below two forces are acting at A of magnitude 2000N,  $30^\circ$  with horizontal and at B of magnitude 800 N,  $45^\circ$  with vertical surfaces as shown below and the weight of box is 500 N find the force exerted by ground to keep the body in stationary condition.



- a) 1000N
- b) 565.68N
- c) 1166.32N
- d) 934.32N

Q8 Three books are placed on top of each other as shown below mass of A is 200Kg, B is 500Kg and C is 850Kg how much force body A has to exert on B to maintain the static condition.



a) 1350Kg

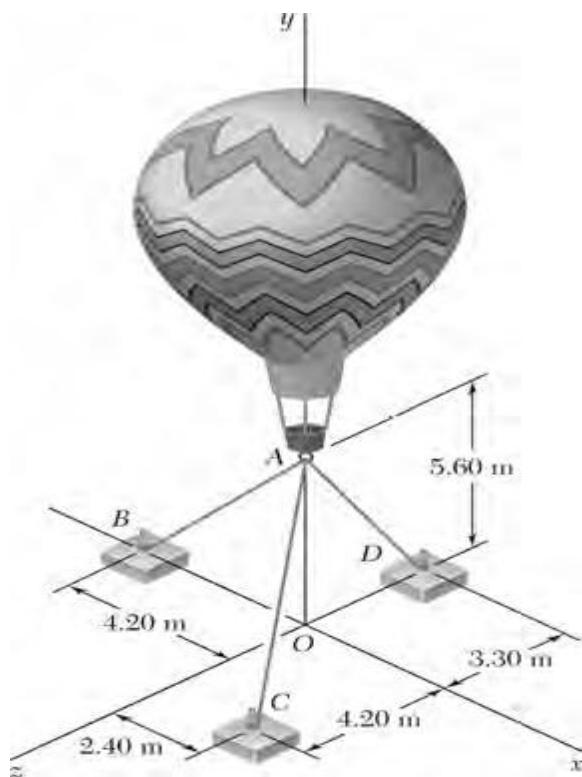
b) 1350N

C)13230N

d) 500N

FOR PROBLEMS 9, 10 AND 11 FOLLOW THE FIG OF PROBLEM 9

Q9 Three cables are used to tether a balloon as shown in fig. knowing that the balloon exerts an 800N vertical force at A then the tension in cable AB would be



a) 202N

b) 373N

c) 200N

d) 201N

Q10 Find the tension in cable AC considering the problem 9 for the diagram.

a)370N

b)369N

c)372N

d)373N

Q11 Find the tension in cable AD considering the problem 9 for the diagram

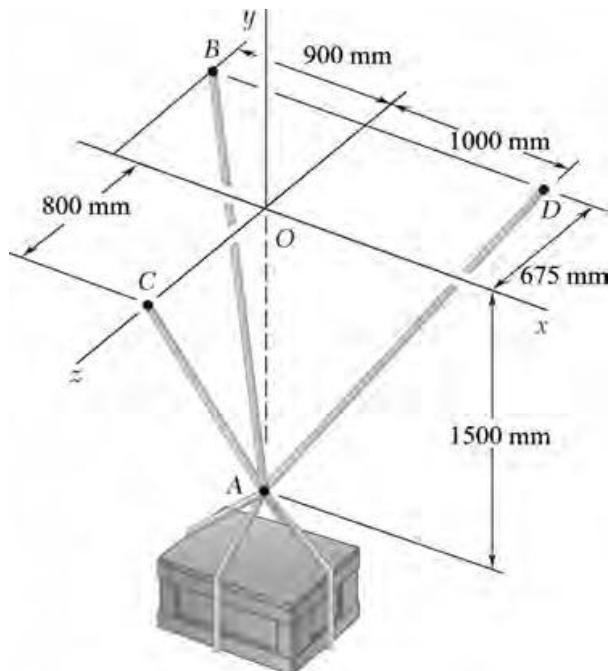
a)415N

b)414N

c)417N

d)416N

Q12 The crate is supported by as shown. Determine the weight of the crate knowing the tension in cable AB is 3750N



a) 10510N

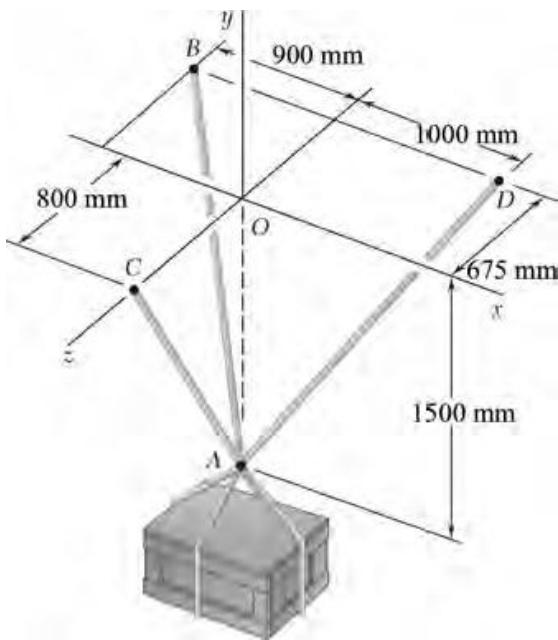
b) 10508N

c) 10500N

d) 10501N

FOR THE PROBLEMS 13, 14, AND 15 FOLLOW THE FIG OF PROBLEM 13

Q13 An 8000N crate is supported by three cables as shown determine the tension in AB cable.



- a) 2855N
- b) 2851N
- c) 2850N
- d) 2855N

Q14 The tension in cable AC is

- a) 4152N
- b) 4155N
- c) 4154N
- d) 4150N

Q15 The tension in cable AD is

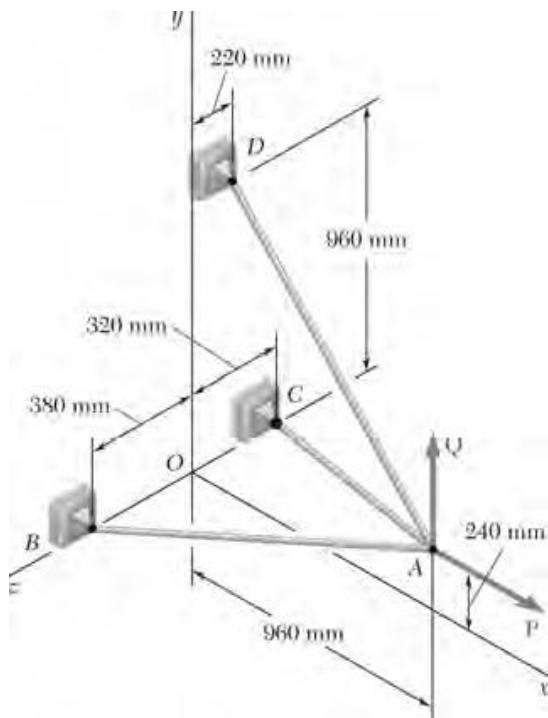
- a) 2640N

b) 2644N

c) 2666N

d) 2500N

Q16 Three cables are connected at A where the forces P and Q are applied as shown knowing that  $Q = 0$ , find the value of P for which the tension in cable AD is 305N



a) 967N

b) 968N

c) 966N

d) 960N

FOR PROBLEM 17, 18 AND 19 FOLLOW THE FIG OF Q17

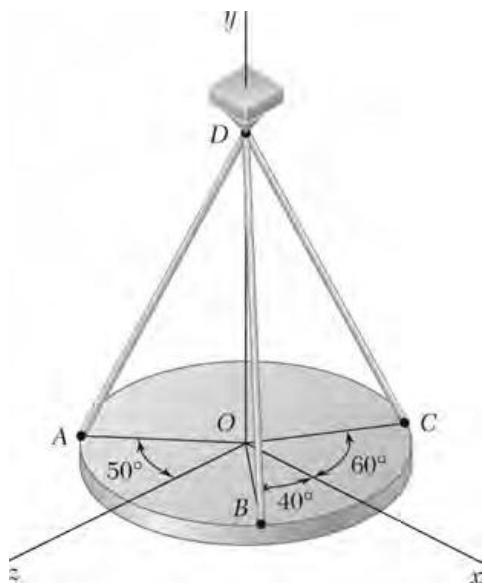
Q17 A circular horizontal plate weighing 300N is suspended as shown from three wires that are attached to a support at D and form 30 degrees with the vertical the tension in wire AD is

a) 147.6N

b) 148.8N

c) 149.9N

d) 147.8N



Q18 The tension in cable BD is

a) 52.4N

b) 54.5N

c) 51.5N

d) 51.3N

Q19 The tension in cable CD is

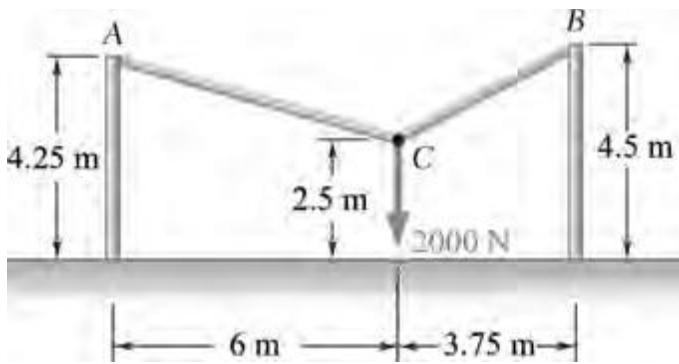
a) 147.6N

b) 148.5N

c) 147.8N

d) 147.9N

Q20 Two cables are tied together at C and loaded as shown determine the tension in cable AC



a) 2525.25N

b) 2525.35N

c) 2525.45N

d) 2525.75N

Q21 The tension in cable BC is

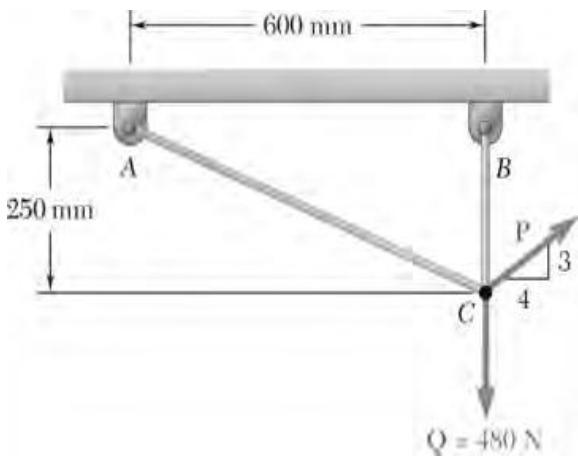
a) 2747.8N

b) 2747.9N

c) 2747.5N

d) 2747.1N

Q22 Two cables are tied together at C as shown knowing that P= 360N and Q = 480N determine the tension AC



a)313N

b)314N

c)315N

d)312N

Q23 The tension in cable BC is

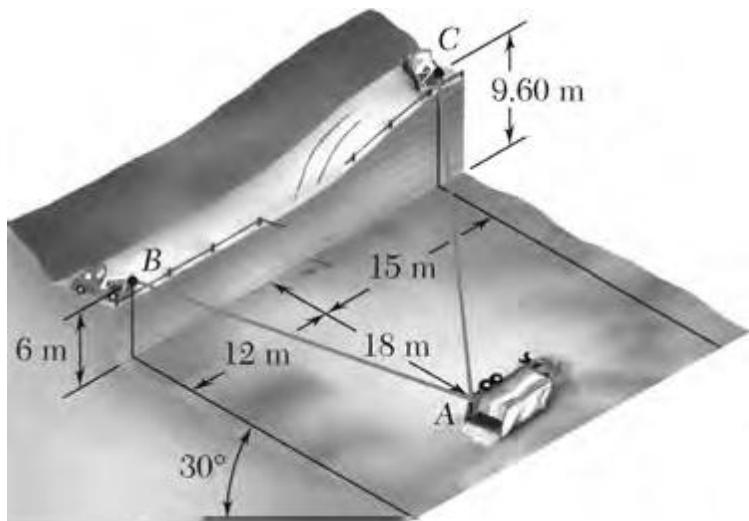
a)145N

b)146N

c)147N

d)144N

Q24 In order to move a wrecked truck two cables are attached at A and pulled by winches at B and C as shown. Knowing that the tension in cable AB is 10Kn and in cable AC is 7.5Kn then the magnitude of the resultant of the forces exerted at A by the two cables is



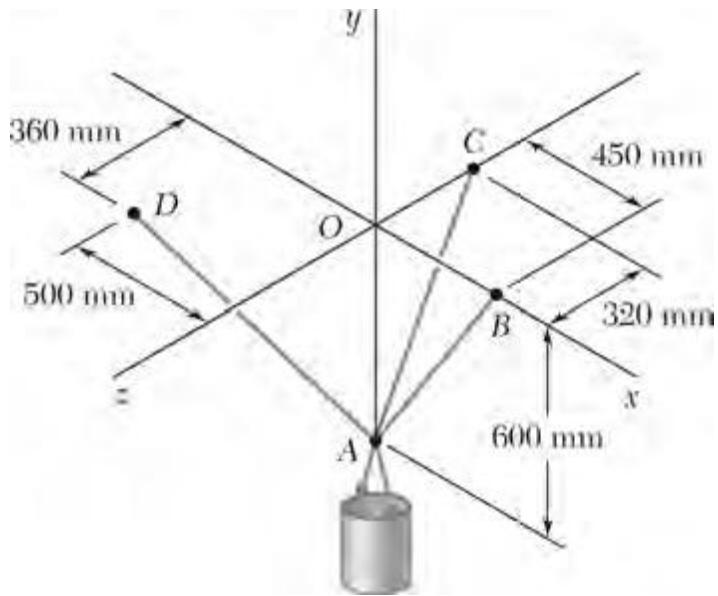
a)1512N

b)1514N

c)1515N

d)1513N

Q 25 The container of weight 1165N is supported by three cables as shown then the tension in cable AB is



- a)400N
- b)500N
- c)499N
- d)501N

Q26 The tension in cable AC is

- a)460N
- b)459N
- c)461N
- d)458N

Q27 The tension in cable AD is

- a)516N

b)517N

c)518N

d)515N

Q28 Two cables are tied together at C are loaded as shown knowing that  $Q=300\text{N}$  determine the tension in cable AC

a)261N

b)260N

c)262N

d)259N

Q29 Then the tension in cable BC is

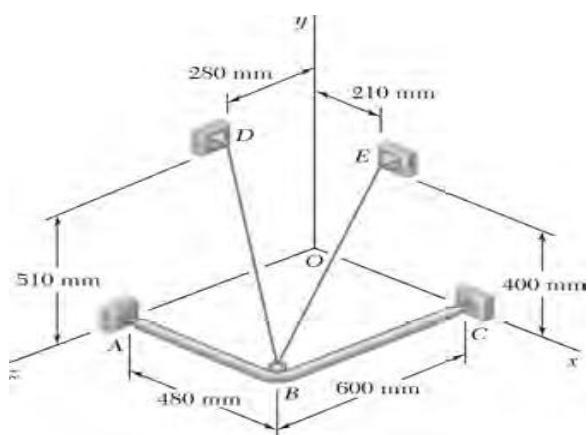
a)252N

b)225N

c)522N

d)226N

Q30 A frame ABC is supported in part by cable DBE that passes through a frictionless ring at B. knowing that the tension in the cable is 385N determine the components of the forces exerted by the cable on the support at D that is  $F_x, F_y, F_z$



a)+255N,-240N,+160N

b)+240N,-160N,+255N

c)-160N,-240N,+255N

d)+240N,-255N,+160N

.

Ques:-1 Two vectors are given as follows.

$$\vec{A} = -2i - 5j + 2k \quad \vec{B} = -5i - 2j - 3k$$

Find the magnitude of the following vectors:  $\vec{A} \times \vec{B}$

- A) 12      B) 43      C) 18      D) 26      E) 31

Ques:-2 Which of the following statement is true?

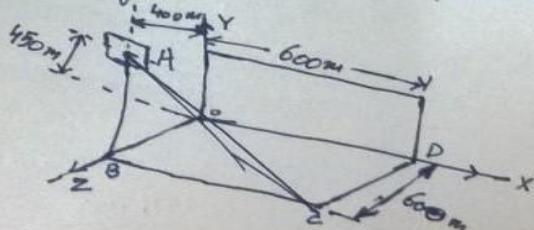
- (a) A scalar quantity can be added to a vector.  
(b) It is possible for the magnitude of a vector to equal zero even though one of its components is non-zero.  
(c) Scalar quantities are path dependent, while vectors are not.  
(d) Scalar quantities and vector quantities can both be added algebraically.  
(e) A scalar contains magnitude and direction while a vector does not.

Ques:-3 Moment of a force about a point does not depends upon -

- (a) line of action of force.      (c) Magnitude of force.  
(b) direction of force      (d) Point at which the force is acting.

Ques:-4 x, y, z components for AB cable:- Given that tension is 4250 N in cable AB

- a) -400, 450, -600  
b) +400, -450, 600  
c) -600, 400, -1000  
d) +600, 450, 1000



Ques:-5 Refer Question 4  $x, y, z$  components for AC cable, given that tension is 5100 N.

- (a) -600, 400, -1000      (c) +600, 450, 800  
(b) -1000, 600, 1000      (d) +1000, -450, 600

Ques:-6 A force  $F$  has the components

$$F_x = 20 \text{ N}, F_y = -30 \text{ N}, F_z = 60 \text{ N}$$

Magnitude of  $F$  is?

- (a) 700      (b) 70      (c) 100      (d) 80.

Ques:-7 Referencce to Ques-6 what are the angles

$\alpha_x, \alpha_y$  &  $\alpha_z$  it forms with co-ordinate axis

- (a)  $90^\circ, 90.0^\circ, 100^\circ$       (c)  $73.4^\circ, 115.4^\circ, 31.0^\circ$   
(b)  $80.0^\circ, 100.4^\circ, 20^\circ$       (d)  $71.4^\circ, 111.4^\circ, 28.0^\circ$

Ques:-8 A force of 500 N force forms angle of  $60^\circ, 45^\circ$  and  $120^\circ$  resp. with the  $x, y$  and  $z$  axis. Find the components  $F_x, F_y$  &  $F_z$  of the force.

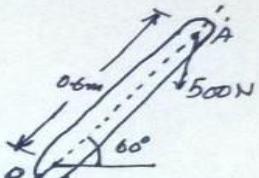
- (a) 225N, 300N, 575N      (c) -225N, 200N, 100N  
(b) 200N, 350N, 500N      (d) 250N, 354N, ~~-250N~~ -250N

Ques:-9 Which one of the following properties satisfies vectors

- (a) Distributive      (c) Commutative  
(b) Associative      (d) None of these.

Ques 3 to A 500N vertical force is applied to the end of a lever which is attached to a shaft at O. Determine the smallest force applied at A which creates the same moment about O.

- (4) 250N (c) 150 N  
 (b) -200N (d) 225 N



Ques-11 Refer Questions -10. How far from the shaft a 1200N vertical force must act to create the same moment about O



Ques:- 12 Horizontal force applied at A which creates the same moment about O. Refer Question-10.

- (a) 278.5 N      (c) 300.5 N  
 (b) 288.5 N      (d) 298.5 N

Ques 5-13 What are the sign conventions taken for moment of forces.

- (a) Clockwise is taken as +ve. (c) Clockwise and anti-clockwise both +ve.  
 (b) Anti-Clockwise is taken as -ve. (d) None of these.  
 (e) Counter-clockwise is taken as +ve.

**Ans 214** According to the definition of Moment of force at point distance d taken is

- (a)  $\perp$  distance from the point where the force acting.
  - (b)  $\parallel$  distance from the line of action of forces from that point.
  - (c)  $\perp$  distance from the line of action of force from that point.
  - (d) All of above.

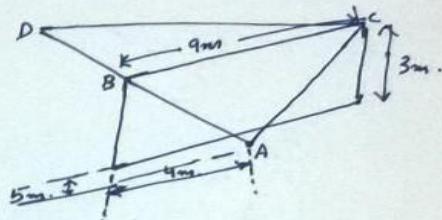
Ques 15 A small section of precast concrete is temporarily held by two cables. Knowing that the tension is 4.2 kN in cable AB and 6 kN in cable AC. What are the components  $x, y, z$  according to the cable AB in meters.

(a) -5, 3, 4

(b) 5, -3, -4

(c) 4, 3, -5

(d) -3, 5, 4



Ques 16 What are the components  $x, y, z$  according to cable AC in Reference to Ques:- 15

(a) -5, 3, -5      (c) 3, 5, -5

(b) -3, -5, -5      (d) -9, 4, -5.

Q.1 The number of reactions at the hinged support. [IV]

- (a) one (b) two (c) three (d) all of the above

Q.2 If one end of a beam is fixed and the other end of the beam is supported by roller, such type of beam is known as

- (a) Cantilever beam (b) Propped cantilever beam  
(c) Continuous beam (d) simply supported beam.

Q.3 :- The no of reaction components at the fixed end of a beam are

- (a) 3 (b) 2 (c) 1 (d) zero.

Q.4 :- UDL stands for

- (a) Point load (b) Uniform dead load.  
(c) Uniformly distributed load.  
(d) All the above.

Q.5 :- Number of different types of supports are commonly used in structures

- (a) Supports can provide a reaction force in one direction only  
(b) Supports can provide a reaction in any direction  
(c) Supports can provide not only reactions in any direction but also moments  
(d) All the above.

Q6 :- FBD stands for \_\_\_\_\_

[2]

Q7 :- Write the forces acting on the sphere of weight  $W$  resting on a frictionless plane surface.

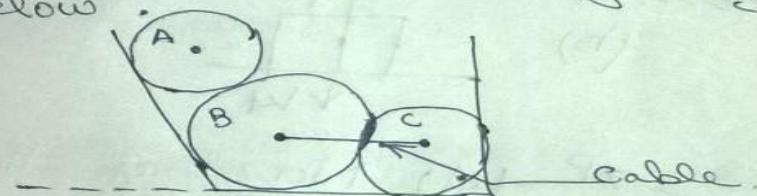


- (a)  $W$  (b) zero (c) reaction force  
(d) both a & c

Q8 :- Draw the FBD of Q7.

- (a) (b) (c) (d) all above.

Q9 :- Draw the FBD of object A as shown.

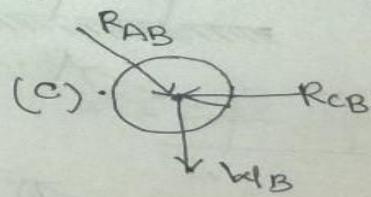


- (a) (b) (c) .

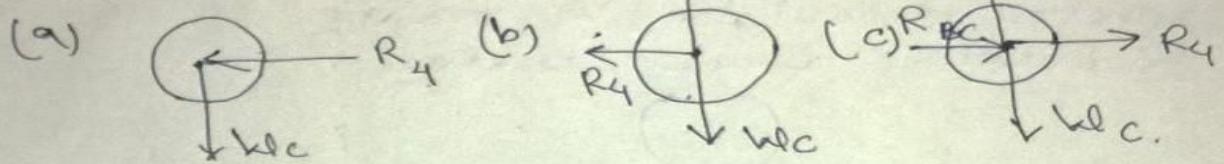
- (d) all of the above.

Q10 :- Fig from problem 9 draw FBD of object B.

- (a) (b) (c) (d) .

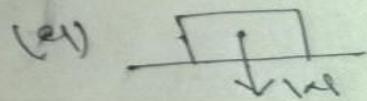
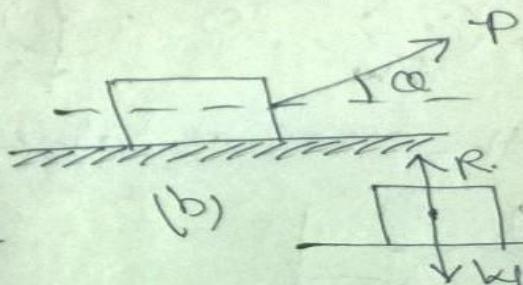


Q11:- From fig is problem 9. draw FBD of object C. [3]

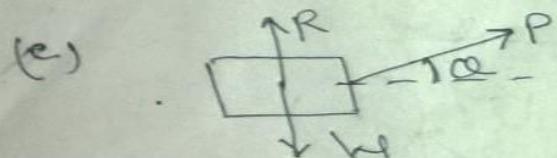
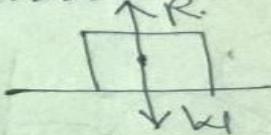


(d) None of the above.

Q12 Draw the FBD of given fig below resting on smooth horizontal surface.

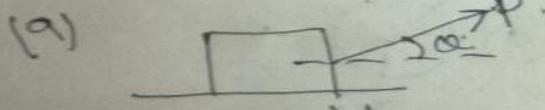
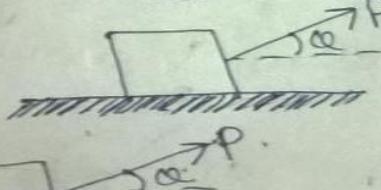


(b)

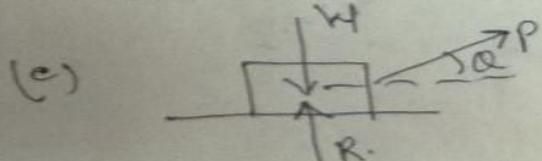
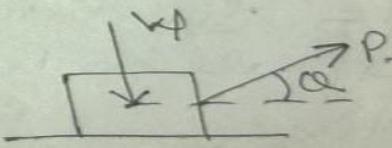


(d) None of the above.

Q13:- Draw the FBD of block resting on rough surface.



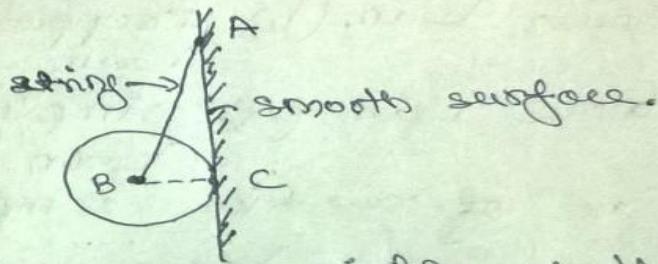
(b)



(d) None of the above.

Q14:- Concept of FBD is important in [A] solving the problems of  
 (a) Moment (b) Resolution (c) Couple  
 (d) Equilibrium of body.

Q15:- A circular roller of weight W hangs by a string and rests against a smooth vertical wall. Then the forces acting on roller.



- (a) force W equal to weight of the roller
- (b) Wall reaction  $R_C$  at the point of contact C with the wall. The reaction will be normal to the wall as it is smooth
- (c) Tension  $T$  in string along BA
- (d) all of the above.

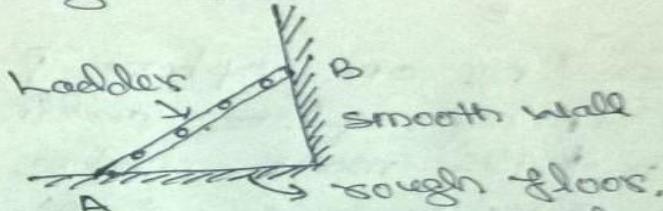
Q16:- A sphere resting in a V-shaped groove.



- (a) Weight of the sphere acting vertically downwards through its centre C.
- (b) Reaction  $R_A$  acting normal to the inclined plane at the contact point A.

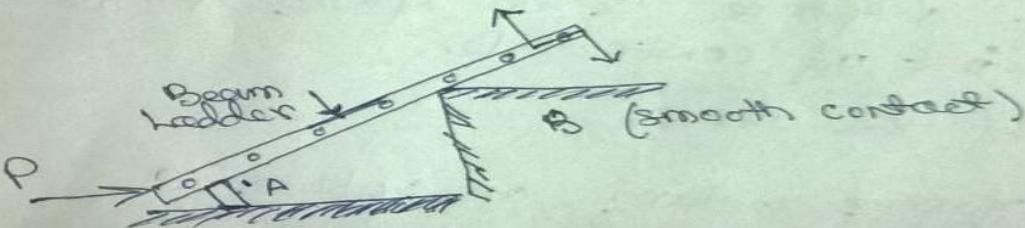
- [15]
- (c) Reaction  $R_B$  acting normal to the inclined plane at  $B$  in contact at point  $B$ .  
 (d) All of the above.

Q17° - A uniform ladder of weight  $W$  leans against a smooth wall and rests on a rough floor.



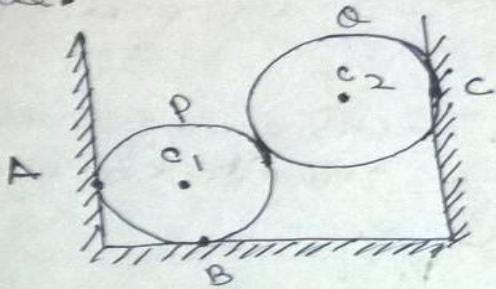
- (a)  $R_B$  (b)  $R_A$  (c)  $W$  of body (d)  $R_A, R_B, W$ .

Q18° - Draw the FBD of the beam ladder and supported.



Ans:- Draw in space below.

Q19:- Two spheres P & Q placed in a vessel.



Forces acting on sphere P

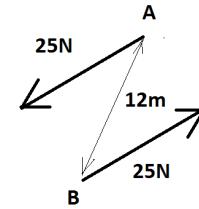
- (a) weight  $w_1$  of sphere acting downwards through its mass centre  $c_1$ .
- (b) Reaction  $R_a$  (towards right) normal to the vertical wall surface.
- (c) Reaction  $R_b$  (upwards) normal to the base.
- (d)  $R_d$  of a sphere Q on sphere P at the point of contact D.
- (e) all of the above.

Q20:- Forces acting on sphere Q.

- (a)  $R_c$  (b)  $w_2$  (c)  $R_d$  (d) all of the above.

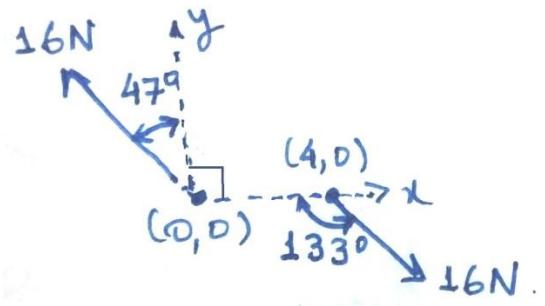
Q1: Find the value of moment of couple of forces 25N acting such that the distance between the points of application of forces is 12m. Acute angle between the line (AB) joining the points of application and any force is  $40^\circ$ .

- (a) 229.813 Nm
- (b) 192.636 Nm
- (c) 600 Nm
- (d) 0 Nm



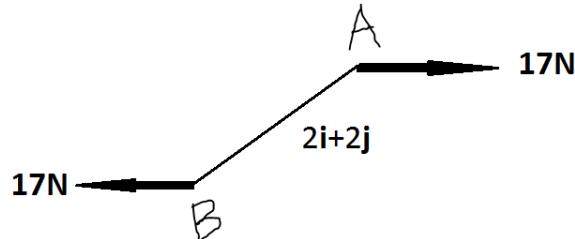
Q2: Determine the moment of couple of 16N.

- (a) -46.807 k Nm
- (b) 46.807 k Nm
- (c) 43.648 k Nm
- (d) -43.648 k Nm



Q3: Determine the shortest distance between the couple of forces causing a moment of couple 34Nm into the plane of paper, when the vector between point of application of forces is  $\mathbf{OA} = 2\mathbf{i} + 2\mathbf{j}$ , provided O is the origin of coordinate system.

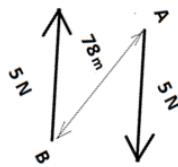
- (a) 1 m
- (b) 2 m
- (c) 3 m
- (d) 4 m



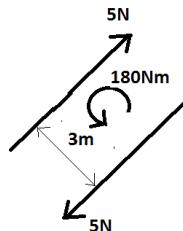
Q4: For two couples to be equivalent, which statement(s) should be true:

- (I) Resultant force acting on the system must be equal.
  - (II) Resultant moment of couple acting on the system must be equal.
  - (III) Components of forces acting on the system must be equal.
  - (IV) Components of moment of forces must be equal
- (a) I only
  - (b) II only
  - (c) II & III only
  - (d) All

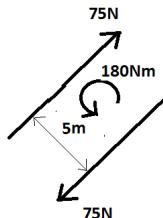
Q5: Which moment of couple among  $\mathbf{M}_A$ ,  $\mathbf{M}_B$  and  $\mathbf{M}_C$  are mutually equivalent.



(I)  $M_A$  is the moment for



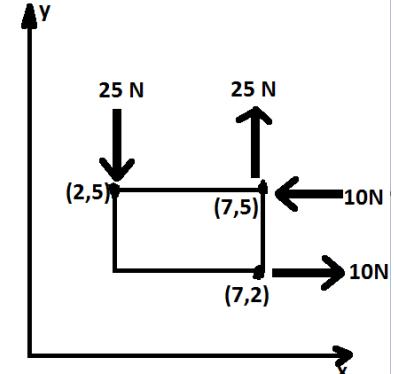
(II)  $M_B$  is the moment for



(III)  $M_C$  is the moment for

- (a)  $M_A$  &  $M_B$
- (b)  $M_A$  &  $M_C$
- (c)  $M_B$  &  $M_C$
- (d) All

Q6: Find the value of magnitude of moment of the given system of couples.



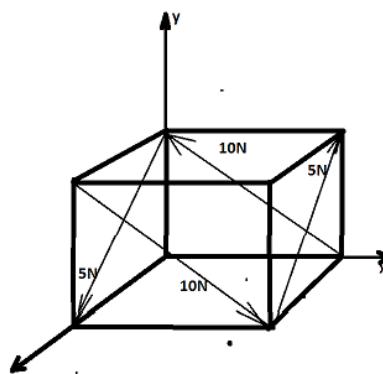
- (a) 125 Nm
- (b) 30 Nm
- (c) 95 Nm
- (d) 155 Nm

Common data questions (Q: 7-9)

For the given system of forces:

Q7: Find the moment of 5N forces

- (a) 25 Nm
- (b) 100 Nm
- (c) 20 Nm



(d) 50 Nm

Q8: Find the direction for moment caused by 5N forces.

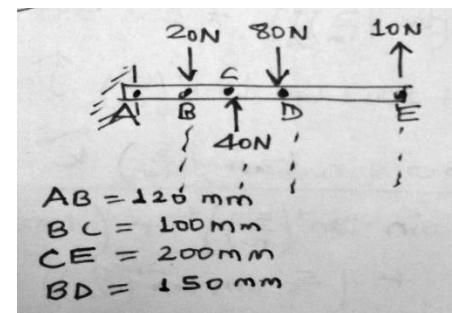
- (a)  $\Theta_x = 45^\circ, \Theta_y = 45^\circ, \Theta_z = 45^\circ$
- (b)  $\Theta_x = 90^\circ, \Theta_y = 90^\circ, \Theta_z = 45^\circ$
- (c)  $\Theta_x = 90^\circ, \Theta_y = 90^\circ, \Theta_z = 45^\circ$
- (d)  $\Theta_x = 90^\circ, \Theta_y = 45^\circ, \Theta_z = 90^\circ$

Q9: Find the resultant moment of couple caused by 5N and 10N couples.

- (a) 0 Nm
- (b) 60.052 Nm
- (c) 14.142 Nm
- (d) 70.711 Nm

Q10: Give equivalent active force and moment at fixed point A.

- (a)  $F_A = -50 \text{ N}, M_A = -12 \text{ Nm}$
- (b)  $F_A = -70 \text{ N}, M_A = -2.4 \text{ Nm}$
- (c)  $F_A = -50 \text{ N}, M_A = -13.2 \text{ Nm}$
- (d)  $F_A = -70 \text{ N}, M_A = -18.4 \text{ Nm}$

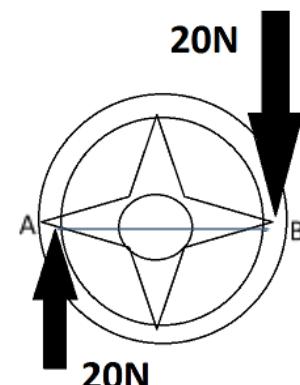


Q11: Two system of vectors are called equipollent when resultant of the forces(**F**) is **R** and moment **M**  
1 – first system; 2 – second system

- (a)  $\sum F_x = 0, \sum F_y = 0, \sum F_z = 0$
- (b)  $\sum F_x = 0, \sum F_y = 0, \sum F_z = 0, \sum M_x = 0, \sum M_y = 0, \sum M_z = 0$
- (c)  $R_{x_1} = R_{x_2}, R_{y_1} = R_{y_2}, R_{z_1} = R_{z_2}, \sum M_{x_1} = \sum M_{x_2}, \sum M_{y_1} = \sum M_{y_2}, \sum M_{z_1} = \sum M_{z_2}$
- (d)  $R_{x_1} + R_{x_2} = 0; R_{y_1} + R_{y_2} = 0; R_{z_1} + R_{z_2} = 0; \sum M_{x_1} + \sum M_{x_2} = 0; \sum M_{y_1} + \sum M_{y_2} = 0; \sum M_{z_1} + \sum M_{z_2} = 0;$

Q12: Find the component of moment of couple in x, y & z directions, when AB = 800 mm and the direction of axis of couple of 20N forces is given as  $45^\circ, 45^\circ, 45^\circ$ .

- (a) 8 Nm, 8 Nm, 8 Nm
- (b)  $8\sqrt{2} \text{ Nm}, 8\sqrt{2} \text{ Nm}, 8\sqrt{2} \text{ Nm}$
- (c) 16 Nm, 16 Nm, 16 Nm
- (d)  $16\sqrt{2} \text{ Nm}, 16\sqrt{2} \text{ Nm}, 16\sqrt{2} \text{ Nm}$



Q 13: A couple produces:

- (a) translatory motion
- (b) rotational motion
- (c) combined translatory and rotational motion
- (d) all the above

Q 14: Two couples will balance one another when they are in the same plane and

- (a) have equal moments and their direction of rotation is same
- (b) have unequal moments and their direction of rotation is opposite
- (c) have equal moments and their direction of rotation is opposite
- (d) none of these

Q 15: A couple is a:

- (a) sliding vector
- (b) free vector
- (c) fixed vector
- (d) none of the above

Ques:-1 Two vectors are given as follows.

$$\vec{A} = -2i - 5j + 2k \quad \vec{B} = -5i - 2j - 3k$$

Find the magnitude of the following vectors:  $\vec{A} \times \vec{B}$

A) 12

B) 43

C) 18

d) 26

e) 31

Ques:-2 Which of the following statement is true?

- (a) A scalar quantity can be added to a vector.
- (b) It is possible for the magnitude of a vector to equal zero even though one of its components is non-zero.
- (c) Scalar quantities are path dependent, while vectors are not.
- (d) Scalar quantities and vector quantities can both be added algebraically.
- (e) A scalar contains magnitude and direction while a vector does not.

Ques:-3 Moment of a force about a point does not depends upon -

- (a) line of action of force.
- (b) direction of force
- (c) Magnitude of force.
- (d) Point at which the force is acting.

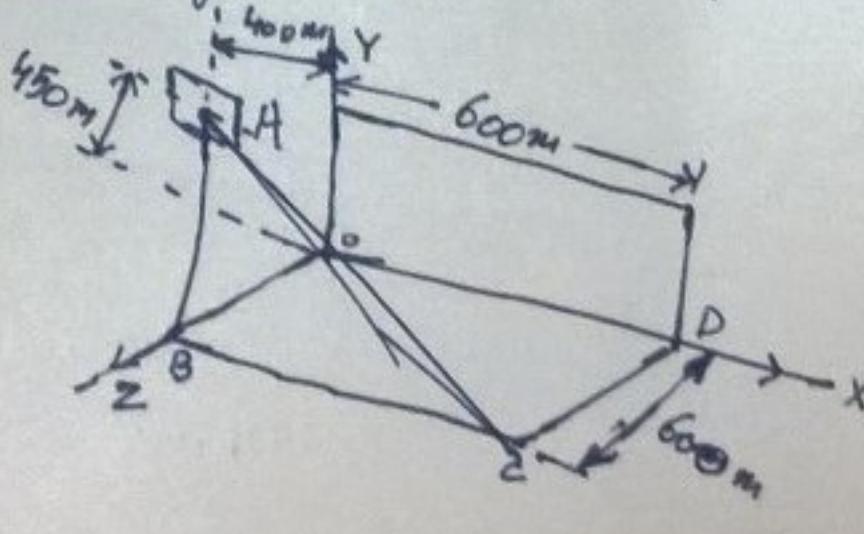
Ques:-4 x, y, z components for AB cable:- Given that tension is 4250 N in cable AB

a) -400, 450, -600

b) +400, -450, 600

c) -600, 400, -1000

d) +600, 450, 1000



Ques:-5 Refer Question 4  $x, y, z$  components for AC cable, given that tension is 5100 N.

- (a) -600, 400, -1000      (c) +600, 450, 800  
(b) -1000, 600, 1000      (d) +1000, -450, 600

Ques:-6 A force  $F$  has the components

$$F_x = 20 \text{ N}, F_y = -30 \text{ N}, F_z = 60 \text{ N}$$

Magnitude of  $F$  is?

- (a) 700      (b) 70      (c) 100      (d) 80.

Ques:-7 Referencce to Ques-6 what are the angles

$\alpha_x, \alpha_y$  &  $\alpha_z$  it forms with co-ordinate axis

- (a)  $90^\circ, 90.0^\circ, 100^\circ$       (c)  $73.4^\circ, 115.4^\circ, 31.0^\circ$   
(b)  $80.0^\circ, 100.4^\circ, 20^\circ$       (d)  $71.4^\circ, 111.4^\circ, 28.0^\circ$

Ques:-8 A force of 500 N force forms angle of  $60^\circ, 45^\circ$  and  $120^\circ$  resp. with the  $x, y$  and  $z$  axis. Find the components  $F_x, F_y, F_z$  of the force.

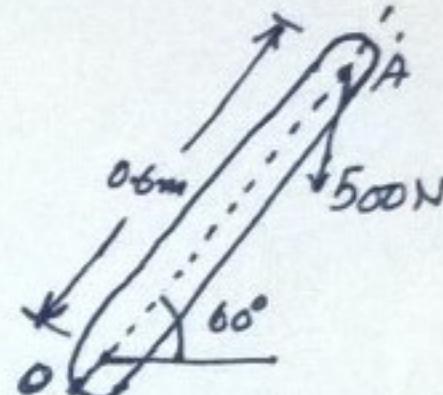
- (a) 225N, 300N, 575N      (c) -225N, 200N, 100N  
(b) 200N, 354N, 500N      (d) 250N, 354N, -~~250~~ -250N

Ques:-9 Which one of the following properties satisfies vectors

- (a) Distributive      (c) Commutative  
(b) Associative      (d) None of these.

Ques 5 to A 500N vertical force is applied to the end of a lever which is attached to a shaft at O. Determine the smallest force applied at A which creates the same moment about O.

- |           |          |
|-----------|----------|
| (a) 250N  | (c) 150N |
| (b) -200N | (d) 225N |



Ques:-11 Refer Question -10. How far from the shaft a 1200N vertical force must act to create the same moment about O

- (a) 0.125 m (c) 0.225 m.  
(b) 0.25 m (d) 0.325 m.

Ques:- 12 Horizontal force applied at A which creates the same moment about O. Refer Question-10.

- (a) 278.5 N      (c) 300.5 N  
(b) 288.5 N      (d) 298.5 N

Ques:-13 What are the sign conventions taken for moment of forces.

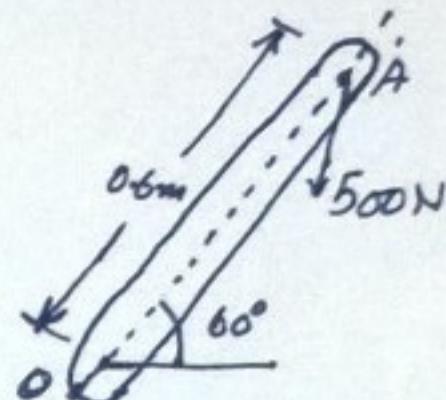
- (a) Clockwise is taken as +ve. (c) Clockwise and anti-clockwise both +ve.  
(b) Anti-Clockwise is taken -ve. (d) None of these.  
(e) Counter-clockwise is taken as +ve.

Ans 14 According to the definition of Moment of force at point distance d taken is

- (a)  $\perp$  distance from the point where the force acting.
  - (b)  $\parallel$  distance from the line of action of forces from that point
  - (c)  $\perp$  distance from the line of action of force from that point.
  - (d) All of above.

Ques 8 to A 500N vertical force is applied to the end of a lever which is attached to a shaft at O. Determine the smallest force applied at A which creates the same moment about O.

- (a) 250N (c) 150N  
 (b) -200N (d) 225N



Ques:-11 Refer Question -10 . How far from the shaft a 1200N vertical force must act to create the same moment about O

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- (a) Clockwise is taken as +ve. (c) Clockwise and anti-clockwise both +ve.  
(b) Anti-clockwise is taken as -ve. (d) None of these.  
(e) Counter-clockwise is taken as +ve.

Ans 2/14 According to the definition of Moment of force at point distance d taken is

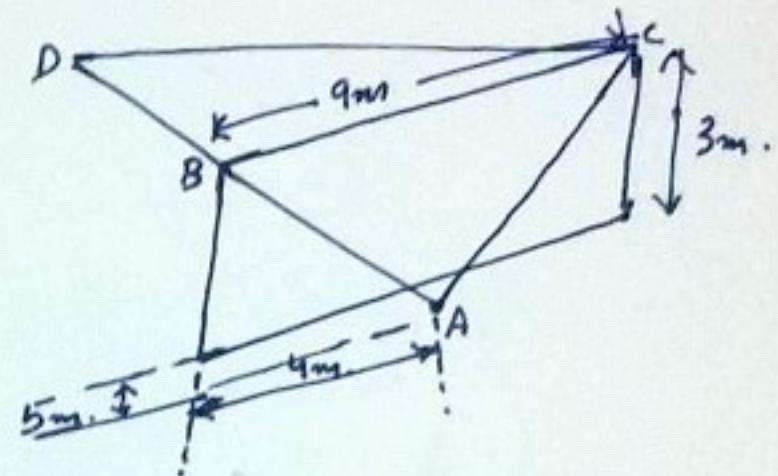
- (a)  $\perp$  distance from the point where the force acting.
  - (b)  $\parallel$  distance from the line of action of forces from that point
  - (c)  $\perp$  distance from the line of action of force from that point.
  - (d) All of above.

Ques 15 A small section of precast concrete is temporarily held by the cables. Knowing that the tension is 4.2 KN in cable AB and 6 KN in cable AC. What are the components  $x, y, z$  according to the cable AB in meters.

a) -5, 3, 4

b) 5, -3, -4

c) 4, 3, -5  
d) -3, 5, 4



Ques :- 16 What are the components  $x, y, z$  according to cable AC.  
in Reference to Ques:- 15

(a) -5, 3, -5

(c) 3, 5, -5

(b) -3, -5, -5

(d) -9, 4, -5.

Q.1 The number of reactions at the hinged support.

- (a) one (b) two (c) three (d) all of the above

Q.2 If one end of a beam is fixed and the other end of the beam is supported by roller, such type of beam is known as

- (a) Cantilever beam (b) Propped cantilever beam  
(c) Continuous beam (d) simply supported beam.

Q.3 :- The no of reaction components at the fixed end of a beam are

- (a) 3 (b) 2 (c) 1 (d) zero.

Q.4 :- UDL stands for

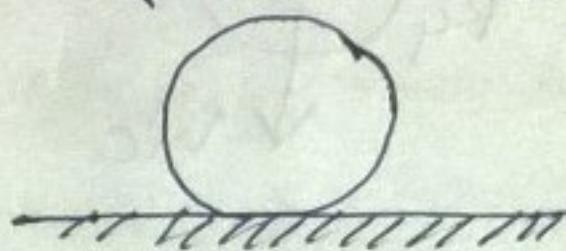
- (a) Point load (b) Uniform dead load.  
(c) Uniformly distributed load.  
(d) All the above.

Q.5 :- Number of different types of supports are commonly used in structures

- (a) Supports can provide a reaction force in one direction only  
(b) Supports can provide a reaction in any direction  
(c) Supports can provide not only reactions in any direction but also moments  
(d) All the above.

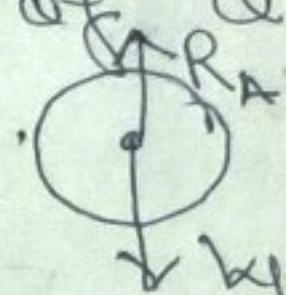
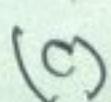
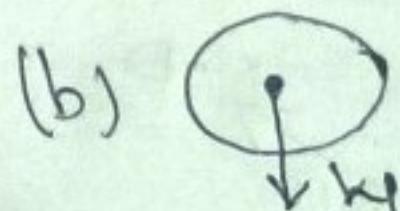
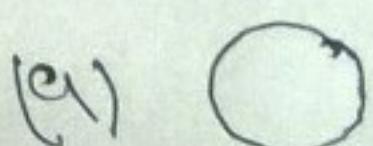
Q6<sup>o</sup> - FBD stands for \_\_\_\_\_ [P]

Q7<sup>o</sup> - Write the forces acting on the sphere of weight  $W$  resting on a frictionless plane surface.



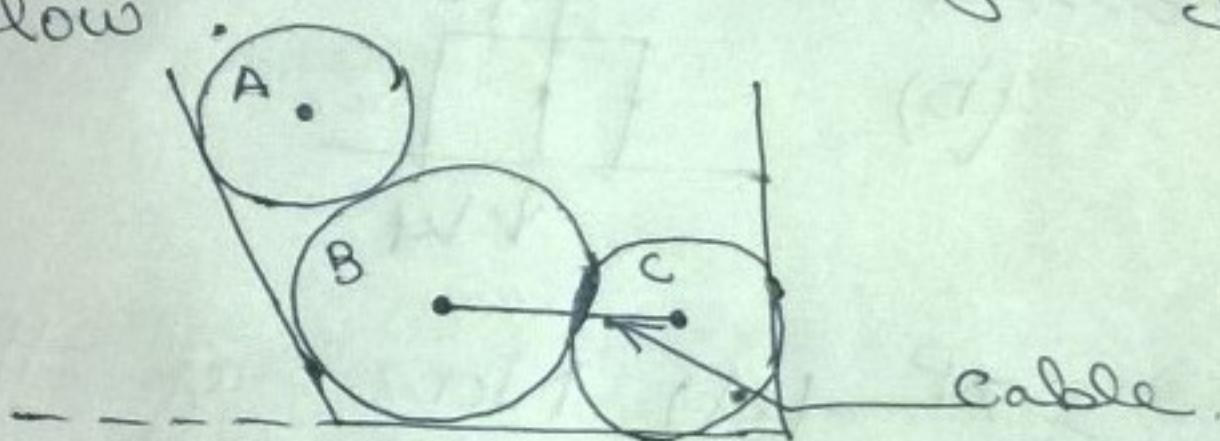
- (a)  $W$  (b) zero (c) reaction force  
(d) both a & c

Q8<sup>o</sup> - Draw the FBD of object A.



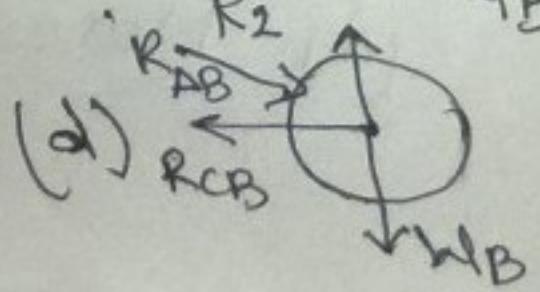
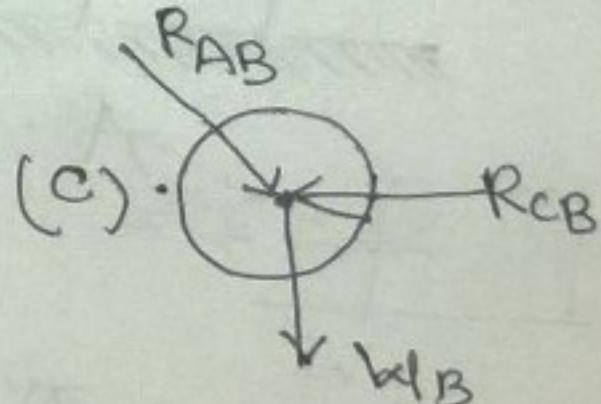
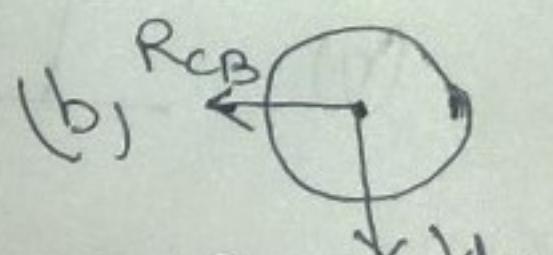
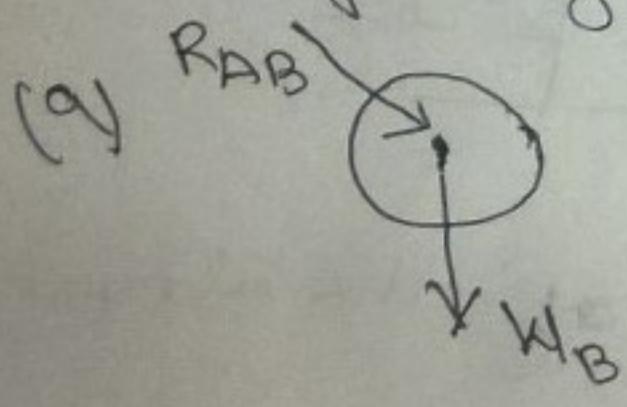
(d) all above.

Q9<sup>o</sup> - Draw the FBD of object A as shown below.

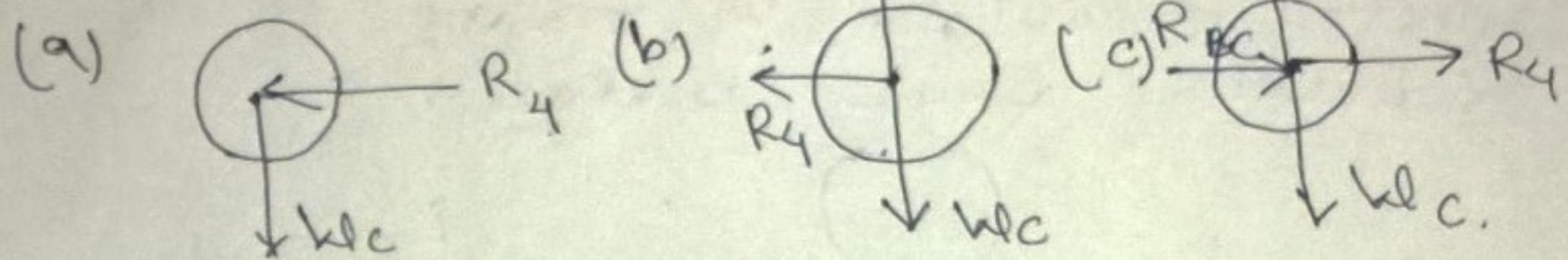


- (a) (b) (c) (d) all of the above.

Q10<sup>o</sup> - Fig from problem 9 draw FBD of object B.

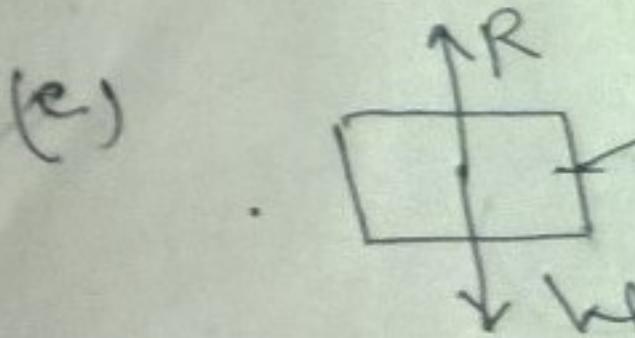
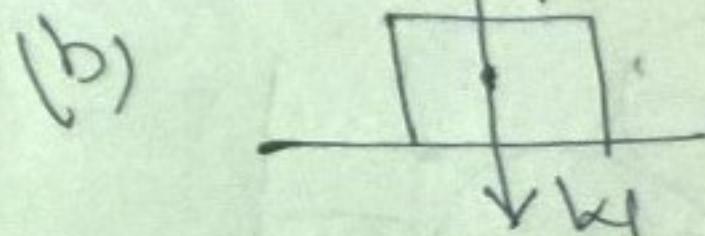
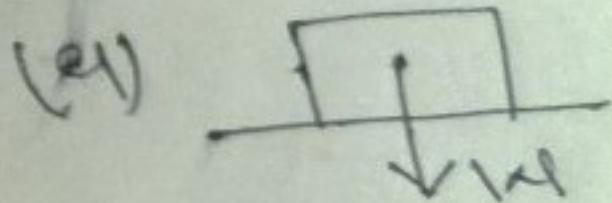
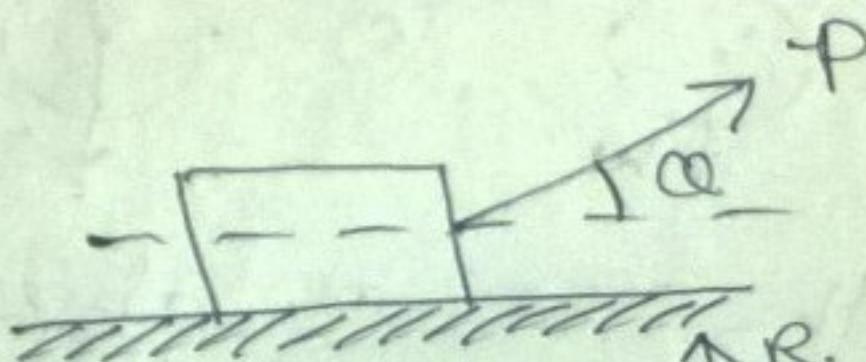


Q11:- From fig is problem 9. draw FBD of object C. 3



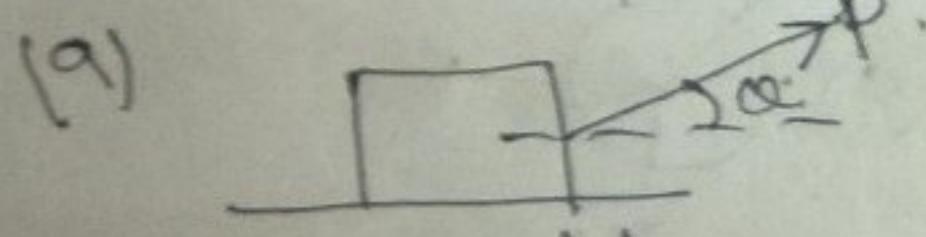
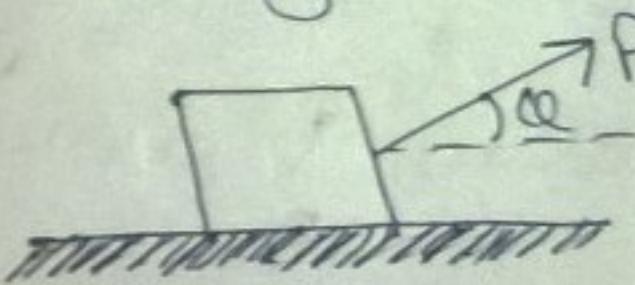
(d) None of the above.

Q12 Draw the FBD of given fig below resting on smooth horizontal surface.

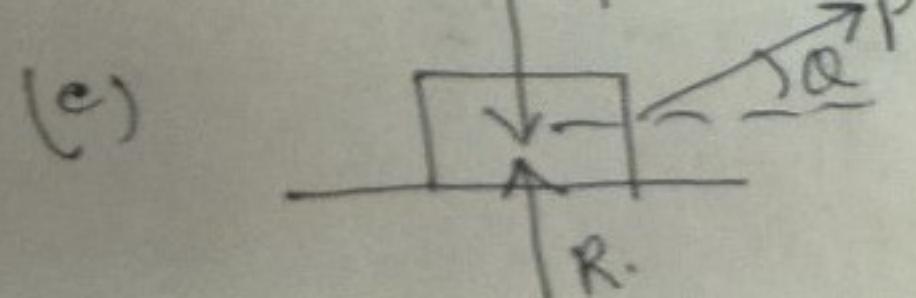
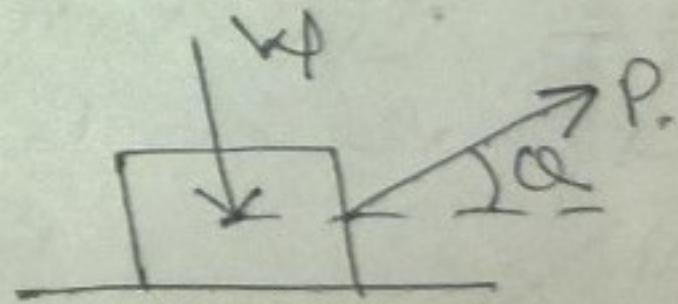


(d) None of the above.

Q13:- Draw the FBD of block resting on rough surface.



(b)

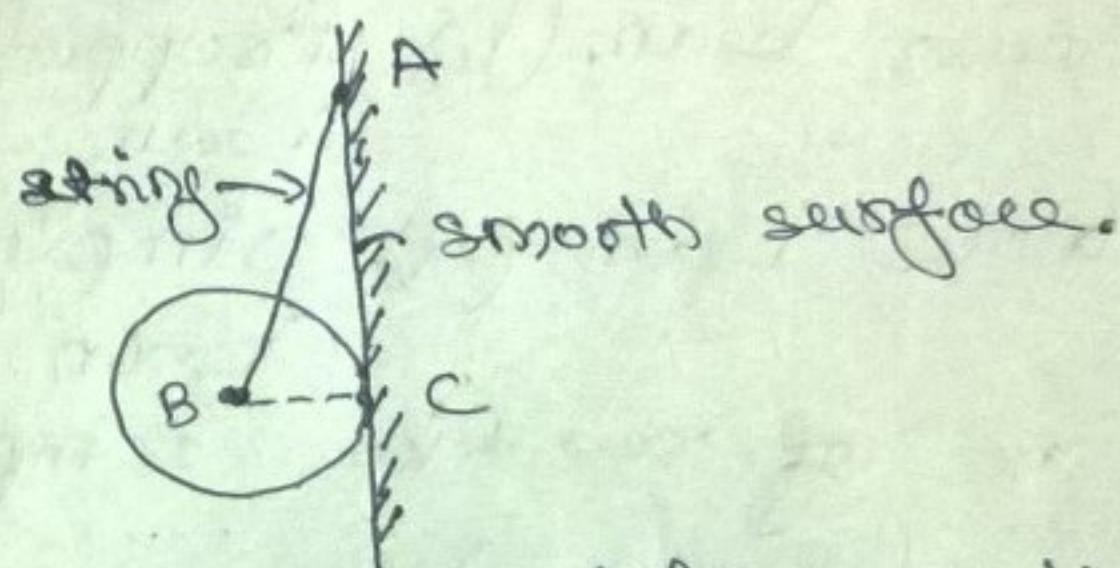


(d) None of the above.

Q14:- Concept of FBD is important in [A]  
Solving the problems of

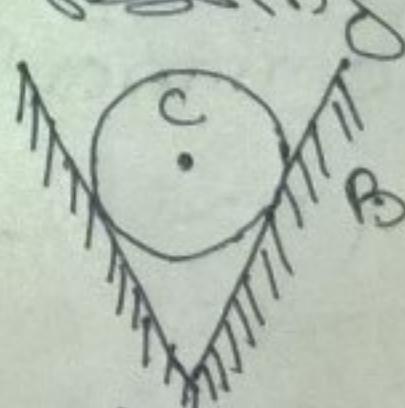
- (a) Moment (b) Resolution (c) Couple.
- (d) Equilibrium of body.

Q15:- A circular roller of weight  $w$  hangs by a string and rests against a smooth vertical wall. Then the forces acting on roller.



- (a) Force  $R$  equal to weight of the roller
- (b) Wall reaction  $R_c$  at the point of contact  $C$  with the wall. The reaction will be normal to the wall as it is smooth
- (c) Tension  $T$  in string along BA
- (d) all of the above.

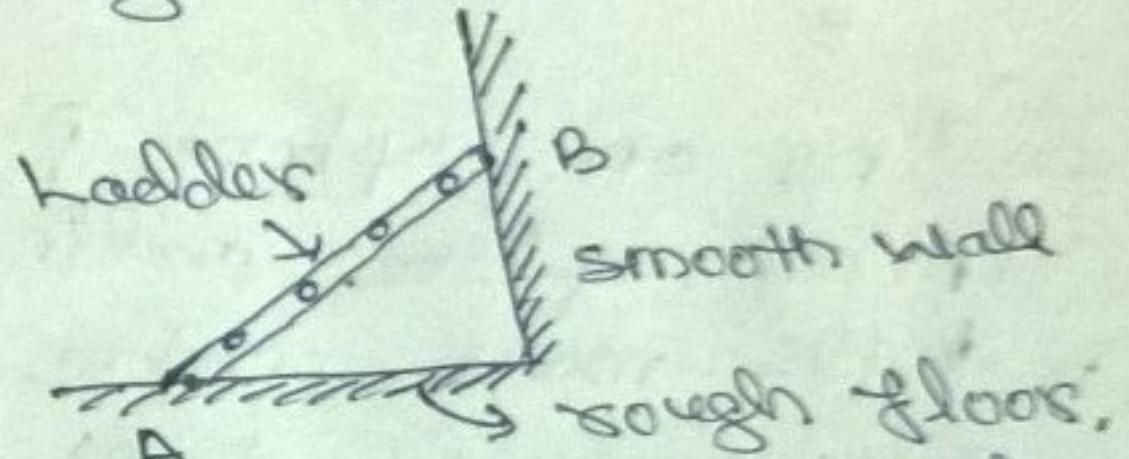
Q16:- A sphere resting in a V-shaped groove.



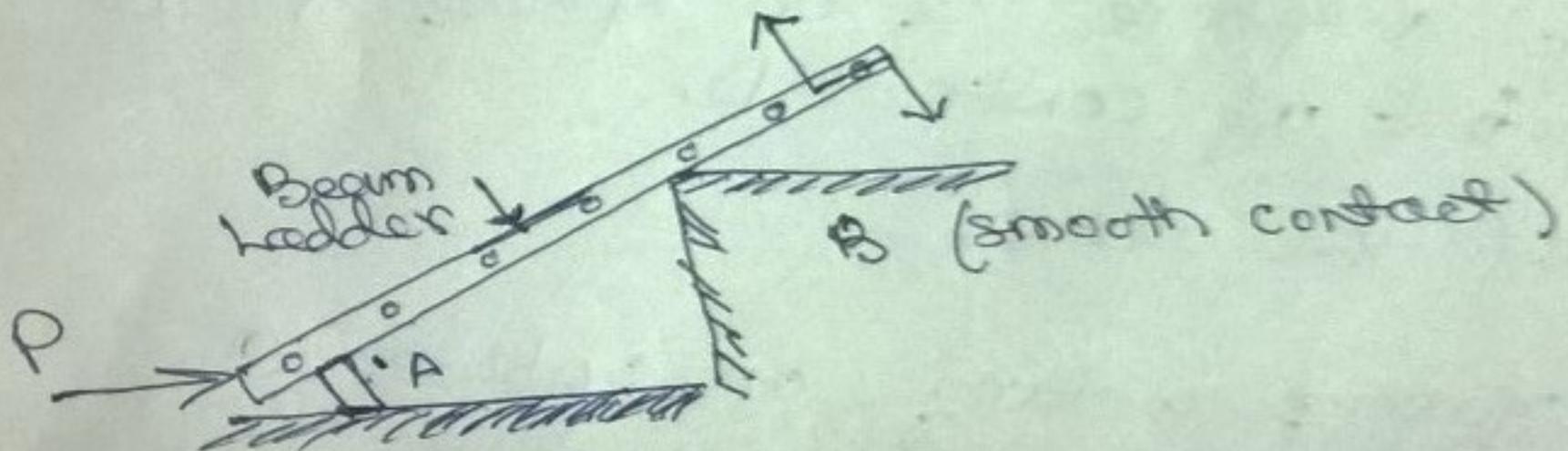
- (a) Weight of the sphere acting vertically downward through its centre C.
- (b) Reaction  $R_a$  acting normal to the inclined plane at the contact point A.

- 15
- (c) Reaction  $R_B$  acting normal to the inclined plane at  $B$  is correct at point B.
- (d) All of the above.

Q17 :- A uniform ladder of weight  $W$  leans against a smooth wall and rests on a rough floor.

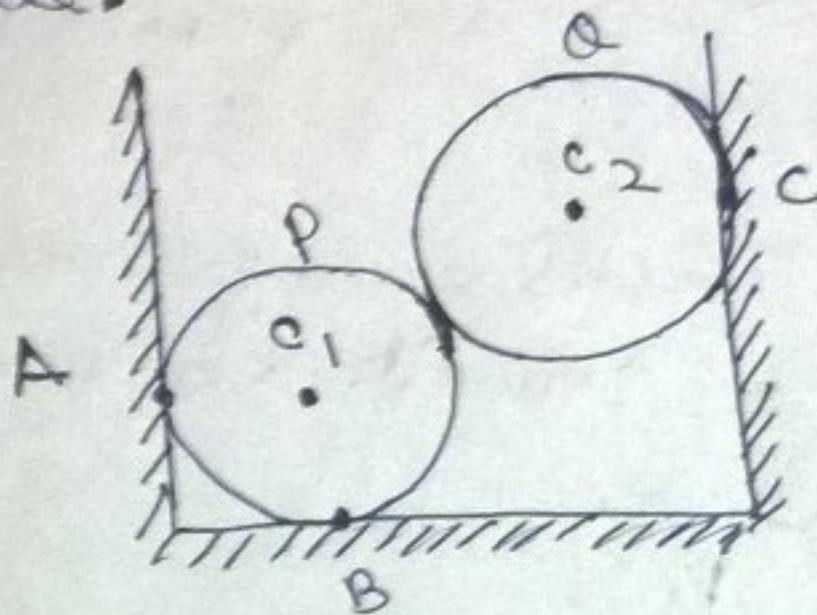


- (a)  $R_B$  (b)  $R_a$  (c) wt of body (d)  $R_a, R_b, W$ .
- Q18° - Draw the FBD of the beam ladder and supported.



Ans:- Drawn in space below.

Q19:- Two spheres P & Q placed in a  vessel.



Forces acting on sphere P

- (a) weight  $W_1$  of sphere acting downwards through its mass centre  $C_1$ .
- (b) Reaction  $R_A$  (towards right) normal to the vertical wall surface.
- (c) Reaction  $R_B$  (upwards) normal to the base.
- (d)  $R_d$  of a sphere Q on sphere P at the point of contact D.
- (e) all of the above.

Q20:- Forces acting on sphere Q

- (a)  $R_c$  (b)  $H_2$  (c)  $R_d$  (d) all of the above.