REV-01
BMT/10/15

2025/06

SET A

B.Sc. MATHEMATICS
FOURTH SEMESTER
MECHANICS I
BMT – 942 IDMN

[USE OMR FOR OBJECTIVE PART]

Duration: 1:30 hrs. **Full Marks: 35**

Objective

Time: 15 mins. **Marks: 10**

Choose the correct answer from the following: ***1×10=10***

1. If two forces $\vec{P}$ and $\vec{Q}$ acting at a point O.Their resultant is
   a. $\vec{R} = \vec{P}^2 + \vec{Q}^2$ b. $\vec{R} = \vec{P} - \vec{Q}$
   c. $\vec{R} = \vec{P} + \vec{Q}$ d. None of the above

2. If the velocity of a particle falling vertically under gravity changes from u to v in time t while descending through aa distance h, *then* h =?
   a. $h = ut - \frac{1}{2}gt^2$ b. $h = ut + gt^2$
   c. $h = ut + \frac{1}{2}gt$ d. $h = ut + \frac{1}{2}gt^2$

3. If $\theta = 90^0$ The Resultant of two coplanar forces $\vec{P}$ and $\vec{Q}$ is
   a. $\sqrt{P^2 - Q^2}$ b. $\sqrt{P^2 + Q^2}$
   c. $\sqrt{P+Q}$ d. $\sqrt{P-Q}$

4. If the angle between two velocities $\vec{u}$ and $\vec{v}$ is zero, then what is the Ressultant velocity ?
   a. $w = u + v + \tan\theta$ b. $w = uv$
   c. $w = u + v$ d. $w^2 = u^2 + v^2 + uv\cos\alpha$

5. The Lami's Theorem states that if three coplanner forces $\vec{P}, \vec{Q}, \vec{R}$ acting at a point be in equilibrium,then

a. $\frac{P}{Sin\alpha} = -\frac{Q}{Sin\beta} = -\frac{R}{Sin\gamma}, \alpha, \beta, \gamma$ are the angles between $\vec{Q}$ & $\vec{R}$, $\vec{R}$ & $\vec{P}$ and $\vec{P}$ & $\vec{Q}$ respectively.

b. $\frac{P}{Sin\alpha} = \frac{Q}{Sin\beta} = \frac{R}{Sin\gamma}, \alpha, \beta, \gamma$ are the angles between $\vec{Q}$ & $\vec{P}$, $\vec{P}$ & $\vec{R}$ and $\vec{P}$ & $\vec{Q}$ respectively.

c. $\frac{P}{Sin\alpha} = \frac{Q}{Sin\beta} = -\frac{R}{Sin\gamma}, \alpha, \beta, \gamma$ are the angles between $\vec{Q}$ & $\vec{R}$, $\vec{R}$ & $\vec{P}$ and $\vec{P}$ & $\vec{Q}$ respectively.

d. $\frac{P}{Sin\alpha} = \frac{Q}{Sin\beta} = \frac{R}{Sin\gamma}, \alpha, \beta, \gamma$ are the angles between $\vec{Q}$ & $\vec{R}$, $\vec{R}$ & $\vec{P}$ and $\vec{P}$ & $\vec{Q}$ respectively.

6. A particle moving in a straight line is at a distance of $x$meter from a given point on the line after t seconds from start where $x = t^2 + 2t - 16$. What is velocity of the paarticle
   a. $3t^2 - 2m/sec$
   b. $3t^2 - 2m/sec^2$
   c. $6tm/sec$
   d. None of the above

7. Two forces having parallel lines of action are known as
   a. Gravitational force
   b. Parallel forcess
   c. Equillibrium force
   d. frictional force

8. The resultant of two velocities $\dot{u}$ and $\dot{v}$ is $\dot{w}$ which is inclined at an angle α can be expressed as
   a. $w^2 = u^2 + v^2 + 2uv\cos\alpha$
   b. $w^2 = u^2 + v^2 + uv\cos\alpha$
   c. $w^2 = u^2 + v^2 - 2uv\cos\alpha$
   d. $w^2 = u^2 - v^2 + 2uv\cos\alpha$

9. If $\vec{P}$ acts at a point A and $\vec{Q}$ acts at a point B,then the line of action of $\vec{R}$ cuts AB internally at C,then

a. $P.AC = Q.BC$ b. $P.AC = -Q.BC$

c. $P.AC = R.BC$ d. none of the above

10. If P be the magnitude of each force and p be the arm then the couple is denoted by

a. $\left(\overrightarrow{P},r\right)$ b. $\left(\overrightarrow{P},p\right)$

c. $\overrightarrow{Pp}$ d. None of the above

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Descriptive

Time : 1 hr. 15 mins. **Marks: 25**

[Answer question no.1 & any two (2) from the rest]

1. Two unequal forces act at a point.Show that their resultant is nearer the greater force. Also Two like parallel forces $\vec{P}$ and $\vec{Q}$ act at A and B respectively and their resultant $\vec{R}$ acts at C on AB.Then find R and AC if $P=12N, Q=8N, AB=10m$ **5**

2. What do you mean by Equillibrium of forces.Forces acting at a point are represented by $2\vec{AB}, 3\vec{BC}, 2\vec{CD}, \vec{DA}, \vec{CA}, \vec{DB}$ where ABCD is a quadrilateral.Show that forces are in equilibrium. **2+8=10**

3. Write the definition of couple.ABCD is rectangle where AB=4units and. BC=3units.Show that the forces of magnitudes 3,8,7,11and 5units acting respectively along $\vec{AB}, \vec{BC}, \vec{CD}, \vec{DA}, \vec{AC}$ form a couple whose moment is of magnitude. **1+9=10**

4. What do you mean by parallel forces.A particle is moving along a straight line under uniform acceleration.It moves through 80m during the 7^{th} second and 120m during 11^{th} second of its motion .Find the distance covered in 1 minute ffrom the start. **2+8=10**

5. Write the definition of Reultant of Velocities.A particle has two velocities of magnitude u each.If the magnitude of one be halved the angle made by the resultant with the other is also halved.Show that the angle between two given velocities is 120^0 **3+7=10**

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