B.Sc. Third year [Sem.-V]

MECHANICS –XIV

UNIT-I

1] Statics is the part of mechanics which deals with the equilibrium of system at- -----

a) rest b) motion c) Rotation d) None

2] Rigid body is system of particles s.t.-------

a) the distances between which changed

b) the distances between which remains unchanged

c) Both a and b

d) None

3] Two forces acting at a point of a rigid body are in equilibrium if ----------

a) They are equal in magnitude and opposite in direction

b) They are equal in direction

c) They are opposite in direction

d) They are equal in magnitude

4] -------- is a system of particles ,the distances between which remains unchanged.

a) Particles **b) Rigid body** c) Body d) none

5] If $\vec{F}$ is force acting at a point making an angle $\frac{\pi}{4}$ to X-axis. Then resolved part of force $\vec{F}$along X-axis is given by ----------

a) 3/F **b)** $\frac{1}{\sqrt{2}}\boldsymbol{F}$ c) 4/F d) none

6] The magnitude of resultant $\vec{R}$ of two forces $\vec{P}$ and $\vec{Q}$ acting at an angle θ when P=Q is ---

$a) R = P\,Cos\,\frac{\theta}{4}$ $b)\ R = 4P\,Cos\,\frac{\theta}{6}$ **c)** $\boldsymbol{R = 2P\,Cos\,\frac{\theta}{2}}$ $d)\ R = P\,Cos\,\frac{\theta}{16}$

7] If two like parallel forces$\vec{P}$ and $\vec{Q}$ acting at a point A and B Then there is a point C divides the line joining the points of application of two like forces internally s.t.---------

a) $\frac{\mathbf{CA}}{\boldsymbol{CB}} = \frac{\mathbf{Q}}{\boldsymbol{P}}$ b) $\frac{CA}{CB} = \frac{P}{Q}$ c) $\frac{AB}{CA} = \frac{P}{Q}$ d) none

8] The magnitude of resultant $\vec{R}$ of two forces $\vec{P}$ and $\vec{Q}$ acting at an angle θ is -----

a) $\boldsymbol{R = \sqrt{P^2 + Q^2 + 2PQCos\theta}}$

b) $R = \sqrt{P^2 + Q^2 + 12PQSin\theta}$

c) $R = \sqrt{P^2 + Q^2 + 2PQSin\theta}$

d) *None*

9] The direction of resultant $\vec{R}$ of two forces $\vec{P}$ and $\vec{Q}$ acting at an angle $\frac{\pi}{2}$, is -----

a) $tan^{-1}\left(\frac{2Q}{P-2Q}\right)$

b) $\boldsymbol{tan^{-1}\left(\frac{Q}{P}\right)}$

c) $tan^{-1}\left(\frac{5P}{2Q}\right)$

d) $tan^{-1}\left(\frac{2Q}{P}\right)$

10] If $\vec{R}$ is resultant of two forces $\vec{P}$ and $\vec{Q}$, if $\measuredangle(\vec{P},\vec{Q}) = 120°$ *and* $\measuredangle(R,\vec{Q}) = 90°$ then $\measuredangle(\vec{P},\vec{R})$ = ----------

a) 30° b) 60° c) 70° d) none

11] The direction of resultant $\vec{R}$ of two forces $\vec{P}$ and $\vec{Q}$ acting at an angle θ, $\vec{R}$ makes an angle α with the direction of $\vec{P}$ is ---------

a) $tan^{-1}\left(\frac{Q}{2P}\right)$

b) $tan^{-1}\left(\frac{PSin\theta}{P + P\tan\theta}\right)$

c) $tan^{-1}\left(\frac{Cos\theta}{P+Q}\right)$

d) $\boldsymbol{tan^{-1}\left(\frac{QSin\theta}{P+Q\cos\theta}\right)}$

12] When the two forces $\vec{P}$ and $\vec{Q}$ acting at an angle θ = 0 then R=

a) P+Q b) P-Q c) 2P+Q d) None

13] The resultant of two forces whose magnitudes are 8 kg and 7 kg. respectively acting at an angle of 60° is ---------

a) 13 kg b) 10 kg c) 19 kg d) 16 kg

14] If the resultant R devides the angle between 2 forces P and Q in the ration 1:2 then ----

a) $\boldsymbol{R=(P^2 - Q^2)/Q}$ b) $R=(P^2Q^2)/Q$ c) $R=(P^2 + Q^2)/2$ d) None

15] A particle is acted upon by three forces in one plane, equal to 2, $2\sqrt{2}$ and 1 kg. resp., the first is horizontal , second acts at 45° to horizontal and third is vertical ,then sum of resolved parts of forces along X-axis is-------

a) 4 kg b) 5 kg c) 12 kg d) 19 kg

16] A push of 18 kg and pull of 35 kg act simultaneously at a point .The resultant of two foeces when angle between them is 135 deg. is ------

a) 49.4 kg b) 45 kg c) 42 kg d) 19 kg

17] If two forces acting at a point are represented both in magnitude and direction by the adjacent sides of a parallelogram drawn through their point of application , their resultant is represented by the diagonal of the parallelogram passing though that point. This is-----

a) Principle of transmissibility of force

b) Law of equilibrium of forces

c) Law of parallelogram of forces

d) None of above

18] If the components $\vec{P}$ and $\vec{Q}$ of the resultant $\vec{R}$ are at ------ angles then they are said to be resolved parts of $\vec{R}$.

a) 60° b) 30° **c) 90°** d) None

19] The resultant of two forces given by m.$\overrightarrow{OA}$and n.$\overrightarrow{OB}$is represented by---------- ,where the point C divides AB internally in the ratio n:m .

a) (m-n) $\overrightarrow{AC}$ b) (m-n) $\overrightarrow{OC}$

c) (m+n) $\overrightarrow{AC}$ **d) (m+n) $\overrightarrow{OC}$**

20] Two forces are said to be like parallel forces when they ---------

a) act in the same direction and their lines of action do not meet at a point

b) act in the same direction and their lines of action meet at a point

c) act in the opposite direction and their lines of action meet at a point

d) act in the opposite direction and their lines of action do not meet at a point

21] The direction of the resultant of unlike parallel forces is -------

a) same as that of bigger component.

b) same as that of smaller component.

c) average of smaller and bigger component.

d) None.

22] If X= 0 and Y=0 then R= ----------

a) 1 b) 2 **c) 0** d) None

23] The magnitude of the resultant of any number of coplanar forces acting at a point is given by -------

$a) R = \sqrt{2X^2 + Y^2}$

$b) R = \sqrt{X^2 - Y^2}$

$c) R = \sqrt{X + Y}$

$\boldsymbol{d) R = \sqrt{X^2 + Y^2}}$

24] The resultant of two like parallel forces $\vec{P}$ and $\vec{Q}$ is equivalent to a force ------

a) $\vec{P}$ - $3\vec{Q}$ b) $\overrightarrow{2P}$. $\vec{Q}$ **c) $\vec{P} + \vec{Q}$** d) $\vec{P}$ - $\overrightarrow{2Q}$

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UNIT-II

1] $\vec{R} \circ \vec{R}$ =------

a) 0 **b)** $\boldsymbol{R^2}$ c) 1 d) None of the above

2] If the three forces acting on a particle be represented in magnitude and direction by the three sides of a triangle ,taken in order then the forces are in equllibrium.This is ---

a) Law of parallelogram

b) Equilibrium of forces

c) Triangle law of forces

d) Polygon of forces

3] If the three forces $\vec{P}$, $\vec{Q}$ and $\vec{R}$ acting on a particle at a point , be in equilibrium then -----

a) $\vec{P}$ - $\vec{Q}$ + $\vec{R}$ = 0 **b)** $\boldsymbol{\vec{P} + \vec{Q} + \vec{R} = 0}$ c) $-\vec{P} + \vec{Q} + \vec{R} = 0$ d) $-\vec{P} + \vec{Q}$ - $\vec{R} = 0$

4] If any number of forces acting on a particle, be represented in magnitude and direction , by the sides of polygon , taken in order, then the forces are in equilibrium. This is -----

a) Law of parallelogram

b) Equilibrium of forces

c) Converse of triangle law of forces

d) Polygon of forces

5] If three forces of magnitude P, Q and R resp. acting on a particle are in equilibrium , each is proportional to the sine of the angle between the other two. This is ----------

a) Law of parallelogram

b) Equilibrium of forces

c) Converse of triangle law of forces

d) Lami's theorem

6] If the three forces acting on a particle are in equilibrium ,they can be represented both in magnitude and direction by the sides of any triangle ,taken in order , and drawn parallel to the given forces. This is -----

a) Law of parallelogram

b) Equilibrium of forces

c) Converse of triangle law of forces

d)Polygon of forces

7] $|\vec{Q} \times \vec{Q}|$ = ------

a) 4Q **b) 0** c) 01 d) None of these

8] Lami's theo States that-----

a) $\frac{2P}{\cos\alpha} = \frac{Q}{\cos\beta} = \frac{R}{\sin\gamma}$ $\measuredangle(\vec{P},\vec{Q}) = \gamma, \measuredangle(\vec{Q},\vec{R}) = \alpha, \measuredangle(\vec{R},\vec{P}) = \beta$

b) $\frac{Q}{\sin\alpha} = \frac{2Q}{\cos\beta} = \frac{R}{\cos\gamma}$ $\measuredangle(\vec{P},\vec{Q}) = \gamma, \measuredangle(\vec{Q},\vec{R}) = \alpha, \measuredangle(\vec{R},\vec{P}) = \beta$

c) $\frac{P}{\sin\alpha} = \frac{Q}{\sin\beta} = \frac{R}{\sin\gamma}$ $\measuredangle(\vec{P},\vec{Q}) = \alpha, \measuredangle(\vec{Q},\vec{R}) = \gamma, \measuredangle(\vec{R},\vec{P}) = \beta$

d) $\frac{P}{\sin\alpha} = \frac{Q}{\sin\beta} = \frac{R}{\sin\gamma}$ $\measuredangle(\vec{P},\vec{Q}) = \gamma, \measuredangle(\vec{Q},\vec{R}) = \alpha, \measuredangle(\vec{R},\vec{P}) = \beta$

9] Three forces of magnitudes P,Q,R acting on a particle are in equilibrium and the angle between P and Q is double the angle between P and R then R^2 =

a) Q(Q-P) b) Q(QP) c) Q(Q+P) d) None of these

10] The necessary and sufficient condition for a system of forces acting on a particle to be in equilibrium is that ----------

a) The algebraic sum of the resolved parts of the given forces along any three coplaner directions must separately vanish.

b) The algebraic sum of the components of the given forces along any three non-coplaner directions doesnot vanish vanish.

c) The algebraic sum of the resolved parts of the given forces along any three non-coplaner directions must separately vanish.

d) None of the above

11] Let four forces $\vec{P},\vec{Q},\vec{R}$ and $\vec{T}$ acting on a particle be in equilibrium then------

a) $\vec{P}+\vec{Q}+\vec{R}+\vec{T}=\mathbf{0}$ b) $\vec{P}-\vec{Q}+\overrightarrow{TR}=2\vec{P}$ c) $\vec{P}-\vec{Q}-\vec{R}+\vec{T}=0$ d) None of above

12] If A and B are two smooth pegs in a horizontal line at a distance 5m apart. Two light enextensible string CA and CB of lengths 3m and 4m resp. attached to pegs .Then the tensions in the strings when a wt. of 10 kg is suspended from C is ----------wt.kg

a) 4,3 **b) 8,6** c) 01 ,6 d) None of these

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UNIT-III

1] Force $\vec{F}$ passes through fixed point of rigid body .The moment of force about the fixed point is equal to ----------

a) 4 **b) 0** c) 01 d) None of these

2] Motion of rotation about some fixed point has ---- for each particle depending on it's position relative to fixed point.

a)Same magnitude and opposite direction

b) different magnitude and direction

c)different magnitude and same direction

d)None of these

3] Motion of translation has ---- for each particle of the rigid body.

a) Same magnitude and opposite direction

b)Same magnitude and direction

c) different magnitude and same direction

d) None of these

4] If e is unit vector then $|\vec{e}|$= -----

a) e b) 0 **c)1** d) None of these

5] The sum of the vector moment of a system forces acting on a particle about any point equals to------

a) Vector moment of their resolved parts about the different point

b) Vector moment of their resultant about the same point

c) Vector moment of their resultant about the different point

d) None of the above

6] Let a force $\vec{F}$ acts at a point P of a rigid body and O is some fixed point in its plane . let p be the length of the perpendicular from O to the line of action of the force $\vec{F}$.Then the product F.p is known as-----

a) Vector moment

b) Moment of the force $\vec{F}$ about O

c) Arm of force

d) couple

7]Vector moment of the force $\vec{F}$ about O is ----------

a) 0 **b)** $\vec{r} \times \vec{F}$ c) $\vec{r}\vec{F}$ d) $\vec{r} + \vec{F}$

8] Let a force $\vec{F}$ acts at a point P of a rigid body and O is some fixed point in its plane . let p be the length of the perpendicular from O to the line of action of the force $\vec{F}$, and $\overrightarrow{OP} = \vec{r}$ .Then the $\vec{r} \times \vec{F}$ is known as-----

a) Moment of the force $\vec{F}$ about O

b) Vector moment of the force $\vec{F}$ about O

c) Arm of force

d) equivalent couple

9] If the point O lies on the line of action of the force $\vec{F}$ then p=----

a) e **b) 0** c)1 d) None of these

10] ---------- acting at different point of a rigid body are said to form a couple

a) Two equal forces ,perpendicular **b) Two equal, unlike , parallel forces**

c) Two unequal ,parallel forces d) Two equal, like, parallel forces

11] Two couples , acting in one plane upon a rigid body ,balance each other if-----

a) their moments are equal and opposite

b) their moments are unequal and opposite

c) their moments are unequal

d) none

12] Two couples, in two ---------- are said to equivalent if they possess the same moment.

a) different and perpendicular planes

b) different and parallel planes

c) same and parallel planes

d) none

13] Magnitude of Moment of a couple =----------

a) e b) 0 **c) F.p** d) None of these

14] A system of forces acting upon a rigid body and force sum $\vec{R} = 0$,and moment sum $\vec{G} = 0$, then there is -----

a) No Translation motion and No Rotational motion

b) Translation motion

c) Translation motion as well as Rotational motion

d) none

15] The vector moment of the resultant couple of two couples acting upon a rigid body is ---------- Of vector moments of given couple.

a) difference b) product **c) sum** d) None of these

16] A system of forces acting upon a rigid body is equivalent to -------

a) Vector moment

b) speed

c) Arm of couple

d) a force at any arbitrary point together with a couple

17] Effect of couple acting on the body produces ---------

a) Rotational motion b) Translation motion

c) Translation motion as well as Rotational motion d) none

18] Let $\vec{F}$ and $-\vec{F}$ two unlike parallel forces , p be the perpendicular distance between them called as ------

a) Couple b) Equivalent couples

c) Arm of couple d) none

19] The necessary and sufficient condition that a given system of forces acting upon a rigid body is in equilibrium is that----------

a) force sum and moment sum vanishes separately

b) force sum is equal to moment sum

c) force sum vanishes but moment sum does not vanishes

d) force sum does not vanishes but and moment sum vanishes

20] Three forces P, Q, R act along the sides BC,CA,AB of a triangle ABC taken in order and if resultant passes trough the incentre of tri. ABC then -------

a) P+Q+R=0 b) P.Q+R=0 c) P+Q.R=0 d) None

21] If $\vec{r} = -\vec{\imath} + 2\vec{\jmath} + 3\vec{k}$ and $\vec{F} = \vec{\imath} + 2\vec{\jmath} + 3\vec{k}$ then Vector moment =--------

a) $\mathbf{6\vec{j} - 4\vec{k}}$ b) $3\vec{\imath} + 6\vec{\jmath} - 5\vec{k}$ c) $2\vec{\jmath} + 18\vec{k}$ d) $7\vec{\imath} - 12\vec{\jmath} + 3\vec{k}$

22] If $\vec{F} = \frac{8}{5\sqrt{2}}(3\vec{\imath} + 4\vec{\jmath} + 5\vec{k})$, then moment of the force about x- axis is ------- units.

a) $\frac{12\sqrt{2}}{5}$ b) $\frac{2}{15\sqrt{2}}$ c) $\frac{12\sqrt{12}}{15}$ d) $\sqrt{2}$

23] Vector moment of a force $\vec{F} = 2\vec{\imath} - \vec{\jmath} + 5\vec{k}$ acting at a point P(1,-2,3) about origin is ----------

a) $6\vec{\jmath} - 4\vec{k}$ **b)** $\mathbf{-7\vec{\imath} + \vec{\jmath} + 3\vec{k}}$ c) $2\vec{\jmath} + 18\vec{k}$ d) $4\vec{\imath} - 12\vec{\jmath} + 3\vec{k}$

24] Vector moment of a force $\vec{F}$ of magnitude 9 kg wt. acting at a point P(1,2,3) along the direction (2,1,2) about the point (2,3,1) is ----------

a) $6\vec{\jmath} + 4\vec{k}$ **b)** $\mathbf{3(-4\vec{\imath} - \vec{\jmath} + 3\vec{k})}$ c) $12\vec{\jmath} + 18\vec{k}$ d) $4\vec{\imath} - 12\vec{\jmath} + 3\vec{k}$