

Mechanics - II

III yr - VI Sem

Dynamics

Unit - I

1) Dynamics is the science which deals with - - - -

- a) motion of bodies
- b) body at rest
- c) body of mass 1
- d) none

2) Dynamics is divided into 2 branches - - - -

- a) Kinematics
- b) Kinetics
- c) both (a) & (b)
- d) none

3) mechanics is the science which deals with - - - -

- a) nature of forces
- b) action on material
- c) both (a) & (b)
- d) none

4) when a particle goes from one pt to another then it is said to be

- a) displaced
- b) in motion
- c) both (a) & (b)
- d) none

5) rate of change of displacement is called - - - -

- a) motion
- b) velocity
- c) accⁿ
- d) none

6) time rate of change of velocity is called - - - -

- a) velocity
- b) speed
- c) accⁿ
- d) none

7) --- are vector quantity
 a) velocity b) acceleration
 ✓ c) both (a) & (b) d) none

8) $v = \frac{d\vec{r}}{dt}$ & $\vec{a} = \frac{d^2\vec{r}}{dt^2}$

9) component of velocity along x & y axes are $v_x =$ _____
 $v_y =$ _____

✓ a) $\frac{dx}{dt}$ & $\frac{dy}{dt}$ b) $\frac{dt}{dx}$ & $\frac{dt}{dy}$

c) $\frac{dx}{dy}$, $\frac{dy}{dx}$ d) none

10) component of velocity, acceleration along x & y axes are a_x & $a_y =$ _____

✓ a) $\frac{d^2x}{dt^2}$, $\frac{d^2y}{dt^2}$ b) $\frac{dx}{dt}$, $\frac{dy}{dt}$

c) $-\frac{d^2x}{dt^2}$, $\frac{d^2y}{dt^2}$ d) none

11) Accⁿ makes an angle ϕ with x-axis then $\tan \phi =$ _____

a) dy/dt ✓ b) d^2y/dt^2

c) d^2x/dt^2

c) dx/dt d) none

12) If $\lim_{\Delta s \rightarrow 0} \frac{\Delta \vec{r}}{\Delta s} = \frac{d\vec{r}}{ds} = \hat{t}$ - is called - - -

a) scalar

✓ b) vector

✓ c) unit vector

d) none

(13) If $\vec{OP} = \vec{e}$ & $\vec{OQ} = \vec{e}^\perp$ unit vector perpendicular to \vec{e} then

a) $\frac{d\vec{e}}{ds} = \vec{e}^\perp$ b) $\frac{d\vec{e}}{ds} = \vec{e}$

c) $\frac{d\vec{e}}{ds} = 1$ d) None

(14) $\lim_{\Delta s \rightarrow 0} \frac{\Delta \theta}{\Delta s} = \frac{d\theta}{ds} = k = \frac{1}{\rho}$

ρ is _____

- a) curvature b) radius of curvature
c) radius d) None

(15) $\frac{d\hat{t}}{ds} = k\hat{n}$, \hat{t} is unit vector tangent at P

(16) Tangential component of velocity is

- a) 0 b) 1 c) 2 d) 4

(17) Tangential component of acceleration is

- a) $\frac{ds}{dt}$ b) $\frac{dv}{dt}$ c) $\frac{de}{dt}$ d) None

(18) Tangential component of accⁿ is

- a) $\frac{d^2s}{dt^2}$ b) $\frac{ds}{dt}$ c) 0 d) None

(19) ^{Normal} tangential component of accⁿ is

- a) $\frac{d^2s}{dt^2}$ b) $\frac{v^2}{\rho}$ c) v d) None

20) unit of angular speed is ---

- a) radian b) radian/sec
c) deg d) None

21) $\frac{d}{dt} \hat{e}_2 = \dots$ $\frac{d}{dt} \hat{e}_0 = \dots$

- ✓ a) $\hat{e}_0, -\hat{e}_2$ b) 0
c) \hat{e}_2, \hat{e}_0 d) None

22) unit of angular accⁿ is ---

- a) rad/sec b) rad/sec²
c) radian d) None

23) radial component of velocity is ---

- ✓ a) \dot{r} b) r c) r^2 d) r^3

24) Transverse component of velocity is ---

- ✓ a) $r \frac{d\theta}{dt} = r\dot{\theta}$ b) r c) r^2 d) None

25) radial component of velocity is $\dot{r} = r\dot{\theta}^2$

26) Transverse component of accⁿ is $\frac{1}{r} \frac{d}{dt} (r^2 \dot{\theta})$

27) Acceleration of a point moving in a plane curve with uniform speed is $\frac{v^2}{r}$

Unit - II (Paper - XVII) Kinetics of particle

1) Action & reactions are ---
a) equal b) opposite
✓ c) equal & opposite d) none

2) By Newton's II law rate of change of momentum is proportional to ---
a) Force b) impressed force
c) velocity d) none

3) every body continues in a state of rest or of uniform motion in a line except in so far as it is compelled by impressed force to change state
is Newton's --- law
✓ a) I b) II c) III d) IV

4) unit of force in FPS - poundal
CGS - dyne
MKS - Newton

5) 1 Newton = 10^5 dyne

6) unit of mass in FPS - pound
CGS - gm
MKS - kg

7) acceleration due to gravity
= 32.2 ft/sec^2 or 981 cm/sec^2

8) 1 lb. wt = 32 poundal, 1 gm wt = 981 dyne
1 Kg wt = 9.81 Newton

9) If \bar{M} denotes linear momentum then $\bar{M} =$ _____

- a) $m\bar{v}$
- b) mv^2
- c) \bar{v}
- d) None

10) The rate of increase of the angular momentum of a particle about O is equal to the moment about O of resultant force on particle. This is principle of angular momentum

11) If the resultant force has zero moment about O, the angular momentum of the particle about that point remains const. This is principle of conservation of angular momentum

12) unit of magnitude of angular momentum in FPS - $lb.ft/sec^2$
CGS - $gm.cm/sec^2$

13) Impulsive force is _____ force

- a) null
- b) ~~ze~~ small
- c) large
- d) None

14) Unit of Impulse - CGS - $gm.cm/sec$
MKS - $kg.m/sec$
FPS - $lb.ft/sec$

15) If the sum of the external forces acting on a system of particles be zero in any direction then the total momentum of the system ~~of~~ in that direction remains same during motion. This is Principle of conservation of linear momentum.

16) If workdone is zero \Rightarrow ---
a) $F=0$ or b) $d=0$
c) $\cos\theta=0$ i.e. $\theta=90^\circ$ or 270°

17) unit of work CGS - erg
FPS - Foot-poundal
MKS - Joule
 $1 \text{ Joule} = 10^7 \text{ ergs}$

18) Time rate of doing work is called ---
a) power or b) energy
c) work or d) None

19) $1 \text{ HP} = 550 \text{ ft. lb/sec}$
 $= 746 \text{ watts}$

20) unit of power CGS = erg/sec
MKS = watt
FPS = ft. poundal/sec

21) The sum of the workdone by any no. of forces is equal to work done by ---
a) resultant or b) single force
c) double force or d) None

21) K.E =

a) $\frac{1}{2}mv$ b) $\frac{1}{2}mv^2$

c) mv d) None

22) change in K.E =

a) work done b) power

c) P. energy d) None

23) possessed by a particle by virtue of its motion

a) K.E b) P.E

c) work d) None

24) possessed by a body by virtue of its position

a) kinetic energy b) potential energy

c) work d) None

25) The necessary & sufficient condition for a force F to be conservative is that the line integral over a closed path C in a conservative field is zero i.e.

$$\oint_C \vec{F} \cdot d\vec{s} = 0$$

26) In conservative field of force the K.E + P.E =

a) 0 b) const. c) variable

d) None

27) velocity of a particle increases from \vec{v}_1 to \vec{v}_2 then gain in K.E = $\frac{1}{2}m(\vec{v}_1 + \vec{v}_2)$

Mechanics (II)

Unit - III (Paper - XVII)

1) Motion of a projectile

1) which eq^s describe rectilinear motion - - -

a) $\frac{dx}{dt} = u + ft = v$

b) $x = ut + \frac{1}{2} ft^2$

c) $v^2 = u^2 + 2fx$

✓ d) All of above

2) The particle moving under gravity is projected in any direction is called - - -

✓ a) projectile b) path

c) trajectory d) none

3) Path of projectile is called - - -

✓ a) trajectory b) root

c) line d) none

4) A point from where the particle is projected is called - - -

✓ a) point of projection b) root

c) end point d) none

5) Initial velocity with which the particle is projected is called - - -

✓ a) velocity of projection b) zero velocity

c) root velocity d) none

6) The direction of velocity of projection with horizontal is called

- a) range of projection
- b) inclined plane
- c) point
- d) none

7) _____ is the distance betⁿ point of projection & the point where the projectile meets the horizontal plane through pt. of projection

- a) Horizontal range of projectile
- b) range of projectile
- c) vertical range of projectile
- d) none

8) The time taken by the particle to come back to the horizontal plane through the point of projection is called time of flight

9) A point of trajectory whose vertical height is greatest is called Highest point of trajectory

10) Cartesian equation of the path of a projectile is _____

- a) $y = x \tan \alpha - \frac{1}{2} \frac{g x^2}{u^2 \cos^2 \alpha}$
- b) $y = x \tan \alpha$
- c) $y = x \cot \alpha$
- d) none

11) Maximum height attained by the particle is _____

- ✓ a) $\frac{u^2 \sin^2 \alpha}{2g}$
- b) $u \sin \alpha$
- c) $u^2 \cos^2 \alpha$
- d) None

12) Time of flight T is given by

- ✓ a) $\frac{2u \sin \alpha}{g}$
- b) $u \sin \alpha$
- c) $2g \sin \alpha$
- d) $u \cos \alpha$

13) Velocity of a particle in terms of its height at that instant is

- ✓ a) $v^2 = u^2 - 2gy$
- b) $v^2 = u^2 + 2gy$
- c) $v^2 = u^2 + 2gy$
- d) None

14) For a given velocity of projection there are two direction of projection which are equally inclined to the direction of maximum range.

15) Projectile to pass through a given point (h, k)

- If $u^2 \geq g [k + \sqrt{h^2 + k^2}]$ then particle will pass through P.
- If $u^2 > g [k + \sqrt{h^2 + k^2}]$ then there are two directions of projection which pass through pt. P.
- If $u^2 = g [k + \sqrt{h^2 + k^2}]$ there is only one direction of projection which pass through P, which is least velocity of projection

16) $t_1 \cdot t_2 = \underline{\quad \quad \quad}$

a) $2R$

b) $2R/g$

c) R

d) $2R^2$

17) A man can throw a cricket ball upto 160 meters & no more. with what speed in m/s, must be thrown?

a) $28\sqrt{2}$ m/s

b) 28 m/s

c) 14 m/s

d) None

18) The angular elevation of enemy's position on a hill, h mts. high is 30° . in order to shell it, the initial velocity of projection must not be less than

a) $\sqrt{3g}$

b) $\sqrt{3gh}$

c) $\sqrt{3h}$

d) None

19) If a particle is projected vertically upward with initial velocity u , then the velocity after time t is given by

$$v = u - gt$$

& dist. s travelled after time t is

$$s = ut - \frac{1}{2}gt^2$$

$$v^2 = u^2 - 2gs$$

If particle falls vertically downward under gravity they

$$v = u + gt$$

$$s = ut + \frac{1}{2}gt^2$$

$$v^2 = u^2 + 2gs$$

20) T is the time of flight of bullet when the horizontal range is R. The inclination of the direction of projection with the horizontal is $\tan^{-1} \left[\frac{gt^2}{2R} \right]$

21) when a particle is projected at an angle α with the horizontal range R & greatest height H, then $\alpha = \tan^{-1} \left(\frac{4H}{R} \right)$

22) If the greatest height attained by two particles are h_1, h_2 then angle of projection

$$\alpha = \tan^{-1} \sqrt{\frac{h_1}{h_2}}$$

23) Range on an inclined plane is

$$R = \frac{u^2 [\sin(2\alpha - \beta) - \sin\beta]}{g \cos^2\beta}$$

24) latus rectum of parabola is

$$\frac{2u^2}{g} \cos^2\alpha$$