

Shikshan Mandal, Karad's
Mahila Mahavidyalaya, Karad
B.Sc. (Part-I) (Preliminary-I) Examination – 2022-23
DSC A1 – PHYSICS- MECHANICS-I (CBCS)

Day and Date : Friday, 13/01/2023

Time: 12:00 to 02:00 pm

TOTAL MARKS 40

Note: 1. All questions are compulsory.

2. Figures to the right indicate full marks.

3. Draw neat labeled diagrams wherever necessary

=====

Q1. Attempt all multiple questions

[8]

- (i) The scalar product of a vector with itself is equal to
- (a) Its magnitude (b) square of its magnitude (c) zero (d) infinity
- (ii) Velocity \vec{v} is a order derivative of position vector \vec{r} with respect to the parameter time t.
- (a) First (b) second (c) third (d) fourth
- (iii) Newton's law of motion is known as law of
- (a) Momentum (b) inertia (c) energy (d) force
- (iv) 1 newton = dyne
- (a) 10^2 (b) 10^3 (c) 10^4 (d) 10^5
- (v) The energy possessed by the body by virtue of its position is energy.
- (a) Kinetic energy (b) potential energy (c) mechanical energy (d) total energy
- (vi) The time rate of change of linear momentum is
- (a) Linear acceleration (b) angular acceleration (c) force (d) torque
- (vii) Greater the value of K... is the acceleration of the body rolling down an inclined plane.
- (a) greater (b) smaller (c) faster (d) stronger
- (viii) Just as force produces linear motion produces rotational motion
- (a) torque (b) moment of inertia (c) angular momentum (d) angular acceleration

Q2. Attempt any TWO of the following

[16]

(i) If $\vec{A} = 2\vec{i} + 2\vec{j} - \vec{k}$ and $\vec{B} = 6\vec{i} - 3\vec{j} + 2\vec{k}$, evaluate

(a) $\vec{A} \cdot \vec{B}$

(b) $\vec{A} \times \vec{B}$

(c) $|\vec{A} + \vec{B}|$

(d) $|\vec{B}|$

(ii) What is frame of reference? What are its types? Give two examples of each.

(iii) Derive expressions for velocity and acceleration of bodies rolling down an inclined plane. Apply the results for rolling spherical shell and solid cylinder.

Q3. Attempt any FOUR of the following

[16]

(i) A solid cylinder of mass 5kg is rolling on a surface without slipping with a velocity of 2m/s. Find its total kinetic energy.

(ii) Evaluate $\vec{A} + \vec{B}$ and $\vec{A} - \vec{B}$ if $\vec{A} = 3\vec{i} + 4\vec{j} + 5\vec{k}$ and $\vec{B} = 2\vec{i} - 5\vec{j} - 4\vec{k}$

(iii) Solve $\frac{d^2y}{dx^2} + 9y = 0$

(iv) Show that the dimensions of momentum and impulse of a force are the same.

(v) State and prove law of conservation of energy in case of single particle.

(vi) Give four examples of Newton's third law of motion.

Shikshan Mandal, Karad's
Mahila Mahavidyalaya, Karad
B.Sc. (Part-I) (Preliminary-I) Examination – 2022-23
DSC 2A – PHYSICS- MECHANICS-II (CBCS)

Day and Date : Friday, 13/01/2023

Time: 03:00 to 05:00 pm

TOTAL MARKS 40

Note: 1. All questions are compulsory.

2. Figures to the right indicate full marks.

3. Draw neat labeled diagrams wherever necessary

=====

Q1. Attempt all multiple questions

[8]

(i) Who gave the helio-centric theory?

(a) Copernicus (b) Tycho-Brahe (c) Kepler (d) Galileo

(ii) The fundamental force which holds the planets in their orbits around the sun is force of attraction.

(a) electromagnetic (b) nuclear (c) electrostatic (d) gravitational

(iii) Damped oscillatory motion occurs when the restoring force is

(a) Greater than damping force (b) less than damping force nuclear
(c) equal to damping force (d) equal to external periodic force

(iv) The total energy of a body performing SHM is E. Ten average kinetic energy of the body over a period is

(a) E (b) E/4 (c) E/2 (d) 2E

(v) Which of the following does not happen due to surface tension?

(a) Oil rises along wick in oil lamps
(b) The soaking of ink by blotting paper
(c) While heating convection currents are formed in water
(d) Some insects can walk along the water surface

(vi) The section of the neutral surface by the plane of bending is called.....

- (a) Bending axis (b) neutral axis (c) free axis (d) plane of axis

(vii) For equilibrium position of bending of beam

- (a) Bending couple $>$ restoring couple
(b) Bending couple $<$ restoring couple
(c) Bending couple = restoring couple
(d) Bending couple = 0

(viii) A small amount of liquid set free in the air takes spherical shape because of its

- (a) High density (b) elasticity (c) surface tension (d) viscosity

Q2. Attempt any **TWO** of the following [16]

- (i) State Newton's law of gravitation and define the universal constant of gravitation. Derive its dimensions.
(ii) What are forced oscillations? Set up differential equation for the same and obtain its solution.
(iii) What do you understand by angle of contact? Derive the condition for angle of contact to be acute or obtuse.

Q3. Attempt any **FOUR** of the following [16]

- (i) State Kepler's law of planetary motion.
(ii) What is meant by central force?
(iii) Derive expressions for P.E (U), K.E (K) and total energy (E) of a particle performing SHM.
(iv) State and explain some applications of surface tension.
(v) Derive expression for the depressions of the centrally loaded circular beam supported at both ends.
(vi) Obtain expression for work done in twisting a wire