



Sanjay Ghodawat University, Kolhapur

2017-18

Established as State Private University under Govt. of Maharashtra. Act No XL, 2017

FY B Sc

School of Science

Semester I

PHS 101

Physics I

Max Marks: 100

~~Nov 2017~~

Re- End Semester Examination (ESE)

Time: 3Hrs

26 Dec

- Instructions for Students:**
- 1) Use of non-programmable calculator is allowed
 - 2) All questions are compulsory

Q1	Answer the following questions	Marks	COs
a)	Multiple choice questions	10	All
i)	Moment of inertia of a spherical shell about its diameter is given by _____.		101.2
	(a) $\frac{2}{3}MR^2$ (b) $\frac{3}{2}MR^2$ (c) $\frac{5}{3}MR^2$ (d) $\frac{3}{5}MR^2$		
ii)	The gravitational force of attraction between two bodies separated by a distance r is proportional to _____.		101..3
	(a) r^2 (b) $1/r^2$ (c) r^3 (d) $1/r$		
iii)	The equation $\frac{d^2y}{dx^2} + P \frac{dy}{dx} + Qy = 0$ is a _____ differential equation.		101.1
	(a) homogeneous second order (b) inhomogeneous second order (c) homogeneous first order (d) all of these		
iv)	The quantity aK^2 is called _____.		101.4
	(a) geometrical moment of inertia (b) flexural rigidity (c) bending moment (d) radius of gyration		
v)	In linear S. H. M., the acceleration A and displacement x from the mean position at time t are such that _____.		101.3
	(a) $A \propto x$ are similarly directed (b) $A \propto x$ but are oppositely directed (c) $A \propto 1/x$ and are oppositely directed (d) $A \propto 1/x$ and are similarly directed		
vi)	A liquid wets a solid surface if the angle of contact between them is _____.		101.4
	(a) a right angle (b) an acute angle (c) an obtuse angle (d) none of these		

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- vii) In the forced vibratory motion, the body is made to vibrate with frequency _____ the frequency of the forced vibration. 101.3
(a) greater than (b) less than (c) not equal to (d) equal to
- viii) The _____ of a differential equation is highest power of the highest order differential coefficient occurring in it. 101.1
(a) degree (b) order (c) linearity (d) none of these
- ix) The highest of the orders of the differential coefficients occurring in a differential equation is called _____ of the differential equation. 101.1
(a) degree (b) order (c) linearity (d) power
- x) A frame of reference is either at rest or moving with a uniform velocity is known as _____ frame of reference. 101.1
(a) inertial (b) non-inertial (c) accelerating (d) all of these
- b) Fill in the blanks 05 All
- i) If T is surface tension of a liquid then the excess pressure inside the liquid drop of radius r is _____. 101.4
- ii) When a beam is fixed at one end and loaded at the other, the middle filament which is neither elongated nor compressed is called _____. 101.4
- iii) Damped oscillatory motion occurs when the restoring force is _____. 101.3
- iv) If there is no external torque acting on a system of particles, the _____ of the system is conserved. 101.2
- v) Viscosity of a fluid _____ relative motion between its adjacent layers. 101.4
- c) True or false 05 All
- i) The moment of inertia of rigid body about given axis of rotation is $I = \sum_{i=1}^n m_i r_i^2$ 101.2
- ii) Kepler's first law states that every planet moves around the sun in circular orbit. 101.3
- iii) Motion of rocket is based on the law conservation of linear momentum. 101.2
- iv) If $dE/dt = 0$, the total energy of the system is not conserved. 101.2

- v) Ordinary differential equation contains one dependent variable and one independent variable. 101.1

Q2 Answer the following questions Marks COs
06 101.1

- a) i) Solve first order homogeneous differential equation

$$(x^2 + y^2)dx - 2xydy = 0.$$

- ii) Determine the order and the degree of the following equations.

04

A. $y = x \frac{dy}{dx} + 5 \sqrt{1 + \left(\frac{dy}{dx}\right)^2}$

B. $y \frac{dy}{dx} = x \left(\frac{dy}{dx}\right)^2 + 4$

C. $y = x \frac{dy}{dx} - 2 \sqrt{1 + \left(\frac{dy}{dx}\right)^4}$

D. $\left(\frac{d^2y}{dx^2}\right) + \cos\left(\frac{dy}{dx}\right) = 0$

- b) Explain law of addition of vectors. 06 101.1

OR

- b) Prove that $\vec{A} \cdot \vec{B} = A_x B_x + A_y B_y + A_z B_z$ and 06 101.1

$$\vec{A} \times \vec{B} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix}$$

- c) State and explain Newton's laws of motion. 04 101.1

Q3 Answer the following questions Marks COs
10 101.2

- a) Derive the law of conservation of linear momentum for a system of particle.

- b) Derive an expression for moment of inertia of a spherical shell about its axis of symmetry i.e. about a diameter. 06 101.2

OR

- b) Derive an expression for moment of inertia of a solid cylinder about its own axis of symmetry. 06 101.2

- c) Define the terms a) Angular displacement b) Angular velocity c) Angular acceleration d) Angular momentum 04 101.2

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Q4	Answer the following questions	Marks	COs
a)	Derive an expression for Gravitational field at a point outside spherical shell.	10	101.3
b)	What are forced oscillations? Obtain the differential equation for forced oscillatory motion.	06	101.3
	OR		
b)	Show that the total energy of a body executing or performing a linear simple harmonic motion is constant.	06	101.3
c)	Write a short note on satellite and global positioning system.	04	101.3
Q5	Answer the following questions	Marks	COs
a)	Explain cantilever. Derive an expression for the depression of the free end of a cantilever due to a load.	10	101.4
b)	Derive the equation of continuity for a steady fluid flow.	06	101.4
	OR		
b)	Explain the terms i) surface tension ii) surface energy.	06	101.4
c)	A bar 80 cm long, having breadth and depth 0.5 cm each supported horizontally at its ends. The depression produced at the middle by a load of 200 gm is 2 mm. Calculate Young's modulus of the material of the bar.	04	101.4

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