



MBE-003-001102

Seat No. _____

B. Sc. (Sem. I) (CBCS) Examination

November / December – 2016

Physics : Paper 101

(Old Course)

Faculty Code : 003

Subject Code : 001102

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

- Instructions :**
- (1) The question paper contains total 3 questions.
 - (2) All the questions are compulsory.
 - (3) Figures on the right hand side indicate full marks of related question.
 - (4) Question 1 contains 20 short answer questions of 1 mark each.

1 Answer the following questions in short : **20**

- (1) Define collision.
- (2) If K_1 and K_2 are kinetic energy of the particles before and after collision, then what should be the relation between them, if collision is elastic and inelastic ?
- (3) Gravitational force is conservative or non conservative ? Why ?
- (4) What is rotational analogue of mass ? Define it.
- (5) Write down the statement of conservation of angular momentum.
- (6) If the escape speed from the surface of the earth is V_E , then what will be its value from the surface of the planet whose mass and radius are 2 times those of the earth ?
- (7) Gravitational potential at a point is given by the equation $V = \frac{k}{x^2}$ where k is constant and x is distance. Calculate the intensity of gravitational field at that point.
- (8) If G is the universal gravitational constant and g is the acceleration due to gravity, then write down the unit of G/g in MKS and CGS system.

- (9) What is the value of Young Modulus for a perfect rigid body and complete plastic body ?
- (10) What are the limiting values of Poisson's ratio ?
- (11) Write down the formula of quality factor of a resonance circuit in terms of resistance, inductance and capacitance.
- (12) Parallel resonant circuit is also known as rejecter circuit. Why ?
- (13) In terms of phase difference, what is the meaning of leading quantity ?
- (14) Under which condition, the source behaves as a constant current source ?
- (15) What is multimeter ?
- (16) What are the values of orbital magnetic quantum number, if hydrogen atom is in the d-state ?
- (17) For an atom in $n = 1$ state, $E_1 = -13.6$ eV. What is the ionization energy for this atom ?
- (18) What is the process, known as excitation ?
- (19) What is de-Broglie wavelength in Å , associated with an electron accelerated by a potential difference of 100 volt ?
- (20) What is the relation between group velocity and phase velocity in dispersive media and in free space ?

- 2 (a) Answer the following questions : (any **three**) 6
- (1) Show that the sum of the kinetic and potential energies of a body under conservative force is constant.
 - (2) Define MKS and CGS units of work.
 - (3) Derive Newton's second law for rotational motion.
 - (4) Derive a relation between gravitational field and gravitational potential.
 - (5) Derive Kepler's law of periods of planetary motion.
 - (6) What is tensile stress and compressive stress ?
- (b) Answer the following questions : (any **three**) 9
- (1) Define radius of gyration and discuss it with necessary figure.
 - (2) Derive an equation of gravitational potential at a point.
 - (3) Derive an equation of potential and field due to a solid sphere at a point outside the sphere.
 - (4) Discuss Poisson's ratio.

(5) For a system of n particles, show that the momentum of the system is constant if the net force acting on it is zero.

(6) Prove work-energy theorem.

(c) Answer the following questions : (any **two**) **10**

(1) Show that some kinetic energy is always lost in an inelastic collision.

(2) State and prove theorem of parallel axes with necessary figure.

(3) What is escape velocity ? Derive an equation of escape velocity for a body, when it is projected from the surface of the earth.

(4) Derive equations of orbital speed and time period of satellite.

(5) Describe Searl's method to determine Young Modulus of the material of the given wire.

3 (a) Answer the following questions : (Any **three**) **6**

(1) Show that the dimension of inductive time constant is second.

(2) With necessary figure of waveform, explain phase.

(3) Give the applications of maximum power transfer theorem.

(4) What is spatio quantization ?

(5) Derive de-Broglie wave equation.

(6) Show that de-Broglie wavelength associated with an electron is

$$\frac{12.26}{\sqrt{V}} \text{ \AA } \text{ where } V \text{ is a potential difference.}$$

(b) Answer the following questions : (any **three**) **9**

(1) Derive an expression for rms value of an alternating current.

(2) Write down the equation of phase angle between voltage and current in a series LCR circuit with alternating supply and discuss three cases.

(3) Write down the steps of to obtain Thevenin's equivalent circuit for a given complicated network.

(4) Discuss with necessary figure : Multimeter as an ohm meter.

(5) Write down the names of quantum numbers as well as magnetic quantum numbers.

(6) Discuss : Wave mechanical atom model.

- (c) Answer the following questions : (any **two**) **10**
- (1) Derive an expression for growth of current in LR circuit with dc source.
 - (2) State and prove : Correspondence principle.
 - (3) Show that the de-Broglie wave group associated with a particle travels with the same velocity as the particle itself.
 - (4) What is the effect of nuclear motion on atomic spectra ? Discuss in detail.
 - (5) State and prove: Maximum power transfer theorem.
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