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Printed Pages : 8

P.G. (Semester-II) Examination, 2020

PHYSICS

63

[Sixth Paper : MPHYCC-6]

Time : Three Hours]   [Maximum Marks : 70

Note : Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks. Question **No.1** and **2** are **compulsory**. Answer from all the groups as directed.

GROUP-A

1.   Select the correct answer of the following. [2x10=20]

(a)   For an isotopic, dielectric medium, permeability is :

(i)   zero

(ii)   unity

(iii)   infinity

(iv)   none of the above

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(b)   The vector potential is related to magnetic field as :

(i) $\vec{\nabla} \times \vec{B} = \vec{A}$

(ii) $\vec{\nabla} \times \vec{A} = \vec{B}$

(iii) $\vec{B} = \vec{\nabla}\phi - \vec{A}$

(iv) $\vec{B} = \vec{\nabla} \cdot \vec{A}$

(c)   Normal component of magnetic induction is :

(i)   discontinuous across the boundary

(ii)   continuous across the boundary

(iii)   both (i) and (ii)

(iv)   none of the above

(d)   Maxwell's equation is covariant under :

(i)   Orthogonal transformation

(ii)   Galilian transformation

(iii)   Lorentz transformation

(iv)   All of the above

(e) Electromagnetic field tensor $T_{\alpha\beta}$ is :

    (i)   Symmetric tensor

    (ii)   Anti Symmetric tensor

    (iii)   Both (i) and (ii)

    (iv)   None of the above

(f) Magnetosomic wave in plasma is hydromagnetic wave :

    (i)   perpendicular to $\vec{B}$

    (ii)   parallel to $\vec{B}$

    (iii)   both (i) and (ii)

    (iv)   none of the above

(g) Hydromagnetic wave along $\vec{B}$ in plasma is called :

    (i)   MHD wave

    (ii)   Alfven wave

(iii)   Magnetosonic wave

(iv)   Acoustic wave

(h)   L - W potentials are dependent on the velocity of e^- but independent on the :

     (i)   Charge

     (ii)   Mass

     (iii)   Acceleration

     (iv)   All of the above

(i)   Lorentz force is defined as :

     (i) $\vec{F} = q\,\vec{E}$

     (ii) $\vec{F} = q\vec{V} \times \vec{B}$

     (iii) $\vec{F} = q(\vec{E} + \vec{V} \times \vec{B})$

     (iv)   None of the above

(j)   Velocity of e-m wave in a good conductor is proportional to :

(i) $\sqrt{\sigma}$

(ii) $\dfrac{1}{\sqrt{\sigma}}$

(iii) σ

(iv) σ^2

GROUP-B

2.   Write short notes on **any four** of the following : [5x4=20]

(a)   Plasma parameter

(b)   Retarded potential

(c)   Boundary condition

(d)   E - M wave in free space

(e)   Four vector potential

GROUP-C

Note: Answer **any three** of the following questions : [10x3=30]

3. Set up electromagnetic wave equation in conducting media and free space.

4. Give the significance of Debye shielding. Deduce the expression for Debye potential and shielding.

5. Define Lienard - Wiechert potential. Obtain expression for these potentials.

6. Write down Maxwell's four equation in covariant form and discuss the E - M field tensor.

7. Prove that D'Alembert's operator is invariant under Lorentz transformation.

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20063/350 (6).

P.G. (Semester-II) Examination, 2020

PHYSICS

[Seventh Paper : MPHYCC-7]

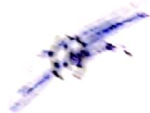Time : Three Hours]   [Maximum Marks : 70

Note : Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks. Question **No 1** and **2** are **compulsory**. Answer from all the groups as directed.

GROUP-A

1. Choose the correct answer of the following questions.

[2×10=20]

(a) A BJT is a :

     (i)   current controlled device

     (ii)   voltage controlled device

     (iii)   resistance controlled device

     (iv)   none of these

(b) In a CE amplifier, the phase of the output voltag has :

    (i) Same phase as that of the input voltag

    (ii) 180° phase change than the input voltag

    (iii) 90° phase change than the input voltage

    (iv) none of these

(c) In an integrator circuit, the feed back element of the Op-Amp is a :

    (i) resistance   (ii) capacitance

    (iii) inductance   (iv) diode

(d) If the non inverting input terminal of an Op-Amp is grounded, then the Potential of the inverting input terminal will be :

    (i) zero

    (ii) infinite

    (iii) equal to the applied signal voltage

    (iv) none of these

(e)   In VJT, the number of P - N junction is :

(i)   One   (ii)   Two

(iii) Three   (iv)   None of these

(f)   The condition for sustained oscillation of a feed back oscillator is :

(i) $A\beta > 1$

(ii) $(1 - A\beta) = 0$

(iii) $(1 + A\beta) = 0$

(iv) $A\beta < 1$

(g)   The excess - 3 code for Decimal number 7 is :

(i)   1011   (ii)   1100

(iii) 1010   (iv)   None of these

(h)   If the output of a logic gate is 1 (one), only when its all inputs are 0 (zero), then the gate is :

(i)   AND gate   (ii)   OR gate

(iii) NOR gate   (iv)   NAND gate

(i)   To set (Q = 1) a R-S flip flop, the preset (Pr) an
       clear (cr) terminals should be :

       (i)   Pr = 0, Cr = 0

       (ii)   Pr = 0, Cr = 1

       (iii)   Pr = 1, Cr = 0

       (iv)   Pr = 1, Cr = 1

(j)   Which of the following Microprocessor is the
       oldest version ?

       (i)   4004   (ii)   8008

       (iii)   8086   (iv)   8085

GROUP-B

2.   Discuss in short, **any four** of the following : [5x4=20]

     (a)   Zener diode

     (b)   Barkhausen Criterion

     (c)   OR - gate

     (d)   K - map

     (e)   Address Bus

20065

Printed Pages : 8

65

P.G. (Semester-II) Examination, 2020

PHYSICS

[Eighth Paper : MPHYCC-8]

Time : Three Hours]   [Maximum Marks : 70

Note : Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks. Question No.1 and 2 are compulsory. Answer any five questions.

GROUP-A

1. Choose the correct answer of the following questions.

[2x10=20]

   (a)   Identical particle having antisymmetrical in nature called :

   (i)   Electron

   (ii)   Proton

(iii)   α - particle

(iv)   None of these

(b)   A very small particle immersed in a liquid exhibits random type of motion, known as :

(i)   Rectilinear motion

(ii)   Brownian motion

(iii)   Constant motion

(iv)   None of the above

(c)   Liquid helium above the temperature 2.18°K behaves in a normal fluid called :

(i)   Helium - I

(ii)   Helium - II

(iii)   Both (i) and (ii)

(iv)   None of the above

(d) The particle obeys Bose-Einstein statistics are
...... in nature.

(i) Symmetrical

(ii) Antisymmetrical

(iii) Both (i) and (ii)

(iv) None of the above

(e) The most probable distribution in case of F.D. statistics is represented by :

(i) $n_i = \dfrac{g_i}{e^{\alpha+\beta Ei} - 1}$

(ii) $n_i = \dfrac{g_i}{e^{\alpha+\beta E_i} + 1}$

(iii) Both (i) and (ii)

(iv) None of the above

(f) The quantum analogy of the classical density function is known as :

(i) Simple operator

20065/350 (3) [P.T.O.]

(ii)   Density operator

(iii)   Heigenberg operator

(iv)   None of the above

(g)   A White dwarf star is a mass of ...... at an extremly high temperature.

(i)   Lithium

(ii)   Barium

(iii)   Helium

(iv)   None of these

(h)   The Grand canonical ensemble is a collection of :

(i)   T, V, S

(ii)   T, V, M

(iii)   T, V, N

(iv)   None of these

(i)   In Micro canonical ensemble the walls are :

   (i)   permeable

   (ii)   impermeable

   (iii)   rigid

   (iv)   none of these

(j)   The wave function belonging to different eigen value is called :

   (i)   Normal

   (ii)   Orthogonal

   (iii)   Both (i) and (ii)

   (iv)   None of the above

GROUP-B

2.   Answer **any four** of the following questions : [4x5=20]

   (a)   Elementary exitation of helium - H

   (b)   Explain quantum treatment of canonical ensemble

(c)   White dwarfs

(d)   Brownian motion

(e)   Density matrix

GROUP-C

Note : Answer **any three** of the following questions : [3×10=30]

3.   Obtain mean energy of a harmonic oscillator on the basis of quantum statistics.

4.   Give an account of thermodynamical behaviour of ideal Base gas.

5.   Define Density matrix. Discuss the problem of free particle in a box on the basis of density matrix.

6.   Discuss and explain Langevin theory of Brownian motion.

7.   Write short notes on the following :

(a)   Micro canonical ensembles

(b)   Fluctuation dissipation theorem

----- X -----