JUNE 2024

202(N)

APPLIED PHYSICS-II

Time Allowed: 3 Hours

Full Marks: 60

Answer to Question No. 1 of Group A must be written in the main answer script. In Question No. 1, out of 2 marks for each MCQ, 1 marks is allotted for right answer and 1 marks is allotted for correct explanation of the answer. However, no marks will be given for wrong explanation of the answer of each MCQ type question.

Answer any Five (05) Questions from Group-B.

GROUP- A

1 Choose the correct answer from the given alternatives and explain your answer (any ten) 2x10=20

(i) What happens to the wavelength of a sound wave in air medium if its frequency increases?
(a) The wavelength decreases, (b) The wavelength increases, (c) The wavelength remains constant.
(d) The wavelength becomes zero

(ii) What is the beat frequency if two waves of frequencies 400 Hz and 405 Hz interfere?
(a) 5 Hz, b) 400 Hz c) 405 Hz, d) 805 Hz

(iii) The working of an optical fibre for transmission of light waves is based on
(a) total internal reflection, (b) refraction, (c) interference, (d) diffraction

(iv) What is the nature of the image formed by a convex lens when the object is placed at twice the focal length?
(a) Real and inverted, b) Virtual and erect, c) Real and erect, d) Virtual and inverted

(v) Velocity of light in vacuum is 3×10^8 m/s. Velocity of light in glass of refractive index 1.5 will be-
(a) 3×10^8 m/s, (b) 4.5×10^8 m/s, (c) 2×10^8 m/s, (d) 2×10^{-8} m/s

(vi) Which of the following factors does capacitance depend on?
(a) Voltage, b) Current, c) Area of plates, d) Resistance

(vii) The S.I. unit of resistivity of a conductor is -
(a) Ohm-m^{-1}, (b) ohm-m^{-2}, (c) Ohm-m^{-3}, (d) Unit-less

(viii) If three currents of 1A, 2A, and 3A enter a junction, the total current leaving the junction according to KCL is- (a) 6A, (b) 5A, (c) 3A, (d) 0A

(ix) An electric lamp is marked 100W, 220V. Its resistance is-
(a) 22Ω, (b) 484 Ω, (c) 576 Ω, (d) 2.2 Ω

(x) The correct dimensional formula of electric field (E = F/q) is-
(a) $[M^1L^1T^{-3}I^{-1}]$, (b) $[M^1L^{-1}T^{-3}C^{-1}]$, (c) $[M^1L^1T^{-2}I^{-1}]$, (d) $[M^1L^{-1}T^{-2}C^{-1}]$

(xi) The weber·m^{-2} (Tesla) is the unit of
(a) magnetic field, (b) magnetic flux density, (c) magnetic flux, (d) none of these

(xii) In a p-n-p or n-p-n transistor, the correct statement is
(a) Emitter region is highly doped (b) Base region is moderately doped (b) Collector region is lightly dopped
(d) none of these

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(xiii). In n-type semiconductor, majority carriers are -
(a) electrons, (b) holes, (c) Electrons and holes (d) none of these

(xiv) As the principal quantum number (n) increases, what happens to the ionization energy of a hydrogen atom?
(a) Increases, (b) Decreases, (c) Remains constant, (d) Fluctuates randomly

(xv) What is the size range of nano-particles ?
(a) 100-1000 nanometers, (b) 10-100 nanometers, (c) 1-10 micrometers (d) 1-100 nanometers

GROUP-B

Answer any Five (05) questions.

2. (i) State the characteristics of simple harmonic motion
(ii) Define free & damped vibration
(iii). Write down the differences between transverse & longitudinal waves
(iv) Define reverberation in acoustics 2+2+3+1

3. (i). Define a) Critical angle, b) Refractive index, c) 1 dioptre e) Optical centre of a lens.
(ii) State the conditions for total internal reflection.
(iii). An object is placed at a distance of 30cm from a convex lens. A real image is formed at a distance of 60 cm from the lens. Find the focal length 4+2+2

4. (i) State Gauss' law in electrostatics
(ii) Define Electric potential and Electric flux
(iii) In a circuit, two capacitors $C_1 = 6\ \mu F$ and $C_2 = 4\ \mu F$ are connected in parallel, and this combination is connected in series with another capacitor $C_3 = 8\ \mu F$. The circuit is connected to a 12 volt battery. Determine the equivalent capacitance of the circuit. 2+(2+1)+3

5. (i) Define resistivity of a material.
(ii) Explain balanced condition of Wheatstone Bridge. Circuit diagram is Essential
(iii) Two resistance R_1 and R_2 are connected in parallel and their equivalent resistance is R. Prove that $R<R_1$ or $R<R_2$ 2+3+3

6. (i). Define Electrical energy and Power. Write the practical unit of electrical energy.
(ii) Distinguish between Peltier effect and Joule effect
(iii) State Kirchhof's Voltage law 3+3+2

7. (i). Write the expression of Lorentz force.
(ii) Explain with circuit diagram how a galvanometer is converted into an ammeter.
(iii) Distinguish between diamagnetic, paramagnetic and ferromagnetic materials 2+3+3

8. (i). State the difference between P-type and N-type Semiconductor.
(ii). Define stimulated emission of radiation.
(iii). What is solar cell ? Why solar cell is ideal for remote rural areas ? 3+2+3

9. (i). Distinguish between insulator, semiconductor and conductor in terms of energy band diagram.
(ii) Draw with proper labelling the V-I characteristics curve for a P-N junction Diode.
(iii). Define Cut-in-Voltage
(iv) Write one drawback of Bohr atomic model 3+3+1+1

10. (i) What do you mean by the term LASER?
(ii). State the characteristics of LASER
(iii). Write two uses of X-rays in scientific and research.
(iv) Draw the symbol of a PNP transistor with proper labeling. 1+3+2+2

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