Sub.Code : 210'D'

HSEB-GRADE XII
2072 (2015)
Physics
(New Course)

It is for those students whose first two digit of registration number starts from 66 or greater than.

Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks.

Time : 3 hrs.

Full Marks:- 75
Pass Marks:- 27

Group 'A'

1. Answer, in brief, any **four** questions: 4x2=8
   a) Resistors R_1 and R_2 are connected in series to an emf source that has negligible internal resistance. What happens to the current through R_1 when a third resistor R_3 is connected in parallel with R_2?
   b) Draw a circuit diagram of meter bridge to determine the resistance of a wire. Give the formula used.
   c) Does a charged particle moving through a magnetic field always experience a force? Explain.
   d) Define angle of dip. What will be its value at a place where the horizontal and vertical components of earth's magnetic field are equal?
   e) Why does acceleration of a magnet falling through a long solenoid decrease?
   f) What is wattless current?

2. Answer, in brief, any **four** questions: 4x2=8
   a) The output of two-input AND gate is fed to a NOT gate. Draw the logic circuit of the combination of gates. Write down its truth table.
   b) What is optical pumping in the production of laser?
   c) All the nuclei have nearly the same density. Justify.
   d) How do the mass number and atomic number of a radioactive element change in an α-decay?
   e) State Hubble's law and write its significance.
   f) What is acid rain? Explain.

3. Answer, in brief, any **one** question: 2
   a) Distinguish between progressive waves and standing waves.

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b) If the pressure amplitude of a sound wave is halved, by what factor does the intensity of the wave change?

4. Answer, in brief, any **one** question: 2
   a) Does the interference of light waves obey the law of conservation of energy? Explain.
   b) What is polarized light? How is it represented?

Group 'B'

5. Answer any **three** questions: 3x4=12
   a) What is thermoelectric effect? How does the thermo emf of a thermocouple vary with increase in temperature of hot junction, keeping cold junction at 0°C? Explain.
   b) Describe an experiment to verify Joule's Laws of heating.
   c) State and explain Biot-Savart law. Use this law to find the magnetic field due to a long straight current carrying conductor.
   d) An alternating current passes through a circuit containing a resistor, a capacitor and an inductor in series. Derive an expression for the phase relation between the current and the voltage.

6. Answer any **three** questions: 3x4=12
   a) Define photoelectric effect. Discuss Einstein's photoelectric equation. What is meant by stopping potential?
   b) Explain the use of a p-n junction diode as a rectifier. Draw the circuit diagram of a full wave rectifier using diodes and explain its working.
   c) State Bohr's postulates of hydrogen atom and use them to calculate the radius of n^{th} orbit of the hydrogen atom.
   d) State the laws of radioactive disintegration. Derive a relation between the half life and decay constant of a radioactive substance.

7. Answer any **one** question: 4
   a) Write down the Newton's formula for the velocity of sound in air. Explain why this formula has to be modified. Discuss Laplace's correction on it.
   b) What is end correction of a pipe? Describe the different modes of vibration of air column in an organ pipe closed at one end.

8. Answer any **one** question: 4
   a) State and explain Huygen's principle. Derive the laws of reflection on the basis of this principle.

b) Discuss the formation of maxima and minima due to Fraunhofer diffraction at a single slit.

Group 'C'

9. Answer any **two** questions: 2x4=8
   a) A battery of 6V and internal resistance 0.5Ω is joined in parallel with another of 10V and internal resistance 1Ω. The combination sends a current through an external resistance of 12Ω. Find the current through each battery.
   b) The coil of a moving coil galvanometer has 50 turns and its resistance is 10Ω.It is replaced by a coil having 100 turns and resistance 50Ω. Find the factor by which the current and voltage sensitivities change.
   c) A long solenoid of 1000 turns and cross sectional area 2×10^{-3} m^2 carries a current of 2A and produces a flux density 52×10^{-3} T inside it. Calculate the self inductance of the coil.
10. Answer any **two** questions: 2x4=8
   a) In a Millikan's oil drop experiment, a drop is observed to fall with a terminal speed 1.4 mm/s in the absence of electric field. When a vertical electric field of 4.9×10^5 v/m is applied, the droplet is observed to continue to move downward at a lower terminal speed 1.21 mm/s. Calculate the charge on the drop. (Density of oil = 750 kg/m^3, viscosity of air = 1.81×10^{-5} kg/ms, density of air = 1.29 kg/m^3)
   b) A X-ray tube works at a dc potential difference of 50KV. Only 0.4% of the energy of the cathode rays is converted into ∝-rays and heat is generated in the target at the rate of 500 watt. Estimate the current passed into the tube and the velocity of the electrons striking the target. (mass of electron = 9×10^{-31} kg, charge of electron = 1.6×10^{-19}C)
   c) The energy liberated in the fission of single Uranium-235 atom is 3.2×10^{-11} J. Calculate the power production corresponding to the fission of 1 gram of uranium per day. (Avogadro constant = 6×10^{23} mol^{-1})
11. A stationary motion detector sends sound waves of 150 KHz towards a truck approaching at a speed of 120 km/hr. What is the frequency of wave reflected back to detector? (Velocity of sound in air = 340 m/s) 4
12. In young's double slit experiment, the slits are 0.03 cm apart and the screen is placed 1.5 m away. The distance between the central bright fringe and fourth bright fringe is 1 cm. Calculate the wave length of light used. 3

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