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| **PB1/PHQP/1222/B 05-DEC-2022** | | | | | | | | | | |
| **PRE-BOARD EXAMINATION- I (2022-23)** | | | | | | | | | | |
| **Subject: Physics**  **Grade:** | | | Max. Marks: 70Time: 3 Hr | | | | | | | |
| **Name:** | | | | **Section:** | | | | **Roll No:** | | |
| |  |  | | --- | --- | | |  | | --- | | **General Instructions:**  (1) There are 35 questions in all. All questions are compulsory  (2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.  (3) Section A contains eighteen MCQ of 1 mark each, Section B contains seven questions of two marks each, Section C contains five questions of three marks each, section D contains three long questions of five marks each and Section E contains two case study-based questions of 4 marks each.  (4) There is no overall choice. However, an internal choice has been provided in section B, C, D and E. You have to attempt only one of the choices in such questions. 5. Use of calculators is not allowed. | | | | | | | | | | | | |
|  | **SECTION A** | | | | | | | |  | |
|  | **Multiple Choice Questions:** | | | | | | | |  | |
| **1** | A plane area of 100 cm2 is placed in uniform electric field of 100 N/C such that the angle between area vector and electric field is 600. The electric flux over the surface is | | | | | | | | | |
|  | **A** | 1 Nm2/C | | | **B** | | 2 Nm2/C | | | |
|  | **C** | 3 Nm2/C | | | **D** | | 0.5 Nm2/C | | | |
| **2** | Two capacitors of value C each are connected in parallel, when this combination is connected in series with an identical combination, the effective capacitance becomes | | | | | | | | | |
|  | **A** | C | | | **B** | | 4C | | | |
|  | **C** | 2C | | | **D** | | C/2 | | | |
| **3** | If drift velocity of electron is vd and intensity of electric field is E, then the relation obeys the Ohm’s law is: | | | | | | | | | |
|  | **A** | vd = constant | | | **B** | | vd αE | | | |
|  | **C** | vd α **√** E | | | **D** | | vd αE2 | | | |
| **4** | A proton and an alpha particle having the same initial speed enter a region of uniform magnetic field and describe circular paths. If the radii of the circles are R1 and R2respectiely, the ratio R1:R2 is | | | | | | | | | |
|  | **A** | 1:1 | | | **B** | | 1:2 | | | |
|  | **C** | 1:4 | | | **D** | | d)2:1 | | | |
| **5** | The examples of diamagnetic, paramagnetic and ferromagnetic materials are respectively | | | | | | | | | |
|  | **A** | copper, aluminium, iron | | | **B** | | aluminium, copper, iron | | | |
|  | **C** | copper, iron, aluminium | | | **D** | | aluminium, iron, copper | | | |
| **6** | The average value of a 12 V peak sine wave over one complete cycle is | | | | | | | | | |
|  | **A** | 7.64 V | | | **B** | | 1.27 V | | | |
|  | **C** | 6.37 V | | | **D** | | 0 V | | | |
| **7** | In R-L-C series resonant circuit magnitude of resonance frequency can be changed by changing the value of | | | | | | | | | |
|  | **A** | R only | | | **B** | | C only | | | |
|  | **C** | L only | | | **D** | | L or C | | | |
| **8** | The optical density of turpentine is higher than that of water while its mass density is lower. Fig 9.2. shows a layer of turpentine floating over water in a container. For which one of the four rays incident on turpentine in Fig 9.2, the path shown is correct | | | | | Ray Optics and Optical Instruments | | | | |
|  | **A** | 1 | | | **B** | | 2 | | | |
|  | **C** | 3 | | | **D** | | 4 | | | |
| **9** | In the Young’s double slit experiment, the two equality bright slits are coherent, but of phase difference is pi/3. If the maximum intensity on the screen is I0, the intensity at the point on the screen equidistant from the slits is | | | | | | | | | |
|  | **A** | I0 | | | **B** | | I0/2 | | | |
|  | **C** | I0/4 | | | **D** | | 3I0/4 | | | |
| **10** | A shunt resistance required to allow 4% of the main current through the galvanometer of resistance 48Ω is | | | | | | | | | |
|  | **A** | 1 Ω | | | **B** | | 2 Ω | | | |
|  | **C** | 3 Ω | | | **D** | | 4 Ω | | | |
| **11** | When an electron jumps from the fourth orbit to the second orbit, one gets the | | | | | | | | | |
|  | **A** | Second line of Balmer series | | | **B** | | First line of Pfund series | | | |
|  | **C** | Second line of Paschen series | | | **D** | | Second line of Lyman series | | | |
| **12** | EM waves can be produced by a charge: | | | | | | | | | |
|  | **A** | An accelerated charged particle | | | **B** | | at rest. | | | |
|  | **C** | A charged particle moving with constant speed | | | **D** | | either at rest or moving with constant velocity. | | | |
| **13** | A half wave rectifier is being used to rectify an alternating voltage of frequency 50 Hz. The number of pulses of rectified current obtained in one second is | | | | | | | | | |
|  | **A** | 50 Hz | | | **B** | | 200 Hz | | | |
|  | **C** | 100 Hz | | | **D** | | 25 Hz | | | |
| **14.** | Find the true statement. | | | | | | | | | |
|  | **A** | Displacement current and conduction current are never equal | | | **B** | | The current that flows through connection wires is called conduction current | | | |
|  | **C** | During charging of the capacitor, in the connection wires, conduction current is discontinuous and displacement current is continuous | | | **D** | | During charging of the capacitor, in the gap between the capacitor plates, conduction current is continuous and displacement current is discontinuous | | | |
| **15** | Choose the pictures which are representing forward bias circuit | | | | Description: http://www.dpssharjah.com/DPSSharjah/UserSpace/EEEQuestionBank/46009.jpg | | | | | |
|  | **A** | 1,2 | | | **B** | | 2,3 | | | |
|  | **C** | 3,4 | | | **D** | | 4,1 | | | |
| **Assertion reason** | | | | | | | | | | |
| **16** | **Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below. a) Both A and R are true and R is the correct explanation of A**  **b) Both A and R are true and R is NOT the correct explanation of A 1**  **c) A is true but R is false**  **d) A is false and R is also false**  **Assertion:** The resistivity of conductor increases with the increasing of temperature. **Reason** : The resistivity is the reciprocal of the conductivity. | | | | | | | | | |
|  | **A** | (a) | | | **B** | | (b) | | | |
|  | **C** | (c ) | | | **D** | | (d) | | | |
| **17** | **Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.**  **a) Both A and R are true and R is the correct explanation of A**  **b) Both A and R are true and R is NOT the correct explanation of A 1**  **c) A is true but R is false**  **d) A is false and R is also false**  Assertion : Amperes circuital law holds for steady currents which do not fluctuate with time Reason : Ampere’s circuital law is similar to that of Biot-savart’s law | | | | | | | | | |
|  | **A** |  | | | **B** | |  | | | |
|  | **C** |  | | | **D** | |  | | | |
| **18.** | **Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.**  **a) Both A and R are true and R is the correct explanation of A**  **b) Both A and R are true and R is NOT the correct explanation of A 1**  **c) A is true but R is false**  **d) A is false and R is also false**  **Assertion :**Between any two given energy levels, the number of absorption transitions is always less than the number of emission transitions. **Reason :**Absorption transitions start from the lowest energy level only and may end at any higher energy level. But emission transitions may start from any higher energy level and end at any energy level below it. | | | | | | | | | |
|  | **A** | a | | | **B** | | b | | | |
|  | **C** | c | | | **D** | | d | | | |
| **SECTION B** | | | | | | | | | | |
|  | How can a moving coil galvanometer by converted in to an ammeter? To increase the current sensitivity of a moving coil galvanometer by 50% , its resistance becomes twice its initial resistance. By what factor does its voltage sensitivity change? | | | | | | | | | 2 |
|  | The electrostatic potential V is changing with distance r according to the following graph.    Draw the graph for the variation of electric field with distance r. | | | | | | | | | 2 |
|  | A series LCR ac circuit has L = 2·0 H, C = 32 μF and R = 10 Ω. Calculate the Q value of the circuit. | | | | | | | | | 2 |
|  | Derive the mirror formula for concave mirror with the help of suitable diagram. | | | | | | | | | 2 |
|  | A ray of light PQ enters an isosceles right angled prism ABC of refractive index 1.5 as shown in figure.   1. Trace the path of the ray through the prism. 2. What will be the effect on the path of the ray if the refractive index of the prism is 1.4 ? | | |  | | | | | | 2 |
|  | Draw diagram for a P-N junction to obtain reverse bias characteristic curves. Explain the phenomenon of reverse breakdown for a P-N junction in reserve bias. | | | | | | | | | 2 |
|  | What are energy bands? How are these formed? Distinguish between a conductor and a semiconductor on the basis of energy band diagram. | | | | | | | | | 2 |
|  | SECTION C | | | | | | | | |  |
| **26.** | a) State Gauss law  b) .If three infinite chrged sheets of uniform surface charge densities +σ , +2σ, and -4σ are placed as shwon in figure, then find out electric field intensities at points A and C | | |  | | | | | | 3 |
| **27.** | The given graphs show the variation of intensity of magnetization I with a strength of applied magnetic field H for two magnetic materials p and Q.Identify the materials P and Q.For material B plot the variation of intensity of magnetization with temperature. justify your answer. | | | | | | | | | 3 |
|  | 1. State Huygens’s principle 2. Using Huygens’s principle prove Snell’s law when light ray travels from rarer to denser medium. | | | | | | | | | 3 |
|  | State Bohrs postulate for the permitted orbits for the electron in a hydrogen atom. Use this postulate to prove that the circumference of the *n*th permit orbit for the electron can contain exactly *n* wavelengths of the de-Broglie wavelength associated with the electron in that orbit. | | | | | | | | | 3 |
|  | a)If in the p-n junction diode a square input signal is 4V then find out the output signal across RL     1. Explain the working of given pn diode as shown in the above diagram | | | | | | | | | 3 |
|  | **SECTION D** | | | | | | | | |  |
| **31.** | 1. Describe schematically the equipotential surfaces corresponding to    * 1. a constant electric field in the z-direction,      2. a field that uniformly increases in magnitude but remains in a constant (say, z) direction, 2. (i) An infinitely long thin straight wire has a uniform linear charge density λ. Obtain the expression for the electric field (E) at a point lying at a distance x from the wire, using Gauss’ law.   (ii) Show graphically the variation of this electric field E as a function of distance x from the wire. | | | | | | | | | 5 |
|  | **OR** | | | | | | | | |  |
|  | 1. A small sphere of radius r 1 and charge q1 is enclosed by a spherical shell of radius r 2 and charge q2 . Show that if q1 is positive, charge will necessarily flow from the sphere to the shell (when the two are connected by a wire) no matter what the charge q2 on the shell is. 2. Show that the force on each plate of a parallel plate capacitor has a magnitude equal to (½) QE, where Q is the charge on the capacitor, and E is the magnitude of electric field between the plates. Explain the origin of the factor ½. | | | | | | | | |  |
| **32.** | 1. Derive the expression for the average Power dissipated in a series LCR circuit for an ac source of a voltage, v = vm sin ωt, carrying a current, i =  im sin ( ωt +φ) 2. Hence define the term "Wattless current". State under what condition it can be realized in a circuit. | | | | | | | | | 5 |
|  | **OR** | | | | | | | | |  |
|  | A 2μF capacitor, 100Ω resistor and 8H inductor are connected in series with an AC source.   1. What should be the frequency of the source such that current drawn in the circuit is maximum.? What is this frequency called? 2. If the peak value of emf of the source is 200V, find the maximum current? 3. Draw a graph showing variation of amplitude of circuit current with changing frequency of applied voltage in a series LCR circuit for two different values of resistance R1 and R2(R1 ˃ R2) 4. Define the term ‘Sharpness of Resonance’. Under what condition. Does a circuit become more selective | | | | | | | | |  |
|  | 1. A point object is placed in front of a double convex lens (of refractive index n = n2/n1 with respect to air) with its spherical faces of radii of curvature R1 and R2. Show the path of rays due to refraction at first and subsequently at the second surface to obtain the formation of the real image of the object. Hence obtain the Lens-maker’s formula for a thin lens 2. A beam of light converges at a point P. Now a lens is placed in the path of the convergent beam 12cm from P. At what point does the beam converge if the lens is a concave lens of focal length 16cm?   **OR**   1. Draw a labelled diagram of reflecting type telescope and explain its working 2. A screen is placed 90cm from an object. The image of the object on the screen is formed by a convex lens at two different locations separated by 20cm. Determine the focal length of the lens. | | | | | | | | | 5 |
|  | Case Study :Read the following paragraph and answer the questions.Gustav Robert Kirchhoff, a German physicist, was born on March 12, 1824, in Konigsberg, Prussia. His first research topic was the conduction of electricity. This research led to Kirchhoff formulating the Laws of Closed Electric Circuits in 1845. These laws were eventually named after Kirchhoff and are now known as Kirchhoff’s Voltage and Current Laws. Since these laws apply to all electric circuits, understanding their fundamentals is paramount in understanding how an electronic circuit functions. Although these laws have immortalized Kirchhoff in Electrical Engineering, he has additional discoveries. He was the first person to verify that an electrical impulse travelled at the speed of light. Furthermore, Kirchhoff made a major contribution to the study of spectroscopy and he advanced the research into blackbody radiation. | | | | | | | | | 4 |
|  | 1. State the difference between Kirchooff’s two laws. | | | | | | | | |  |
|  | What is the potential difference (VA​−VB​) between the points A and B in the given figure ? | | |  | | | | | |  |
|  | 1. The following graph shows the variation of terminal potential difference V, across a combination of three cells in series to a resistor, versus the current, I evaluate internal resistance of the each cell. | | |  | | | | | |  |
|  | **OR**  **From the given circuit find the value of I** | | |  | | | | | |  |
| **35.** | **Case Study :**  **Read the following paragraph and answer the questions.**   |  |  |  |  | | --- | --- | --- | --- | | Light is a transverse electromagnetic wave.  Diffraction, and interference are phenomena observed with all waves.  Diffraction is the tendency of a wave emitted from a finite source or passing through a finite aperture to spread out as it propagates.  Diffraction results from the interference of an infinite number of waves emitted by a continuous distribution of source points.   |  |  |  | | --- | --- | --- | | If light is incident onto an obstacle which contains two very small slits a distance d apart, then the wavelets emanating from each slit will interfere behind the obstacle.  Waves passing through each slit are diffracted and spread out.   At angles where the single slit diffraction pattern produces nonzero intensity, the waves from the two slits can now constructively or destructively interfere.   |  |  | | --- | --- | | Fig a | Fig b | | | | | | | | | | | | 4 |
|  | 1. In the above figures, dark and bright fringes are formed on the screen. Compare their patterns formed on the screen. | | | | | | | | |  |
|  | 1. The interference fringe pattern according to the theory is hyperbola. What is the condition for seeing nearly straight fringes? | | | | | | | | |  |
|  | 1. The ratio of intensity of maxima and minima in an interference pattern is 100:64. Calculate the ratio of intensities of the coherent sources producing this pattern. | | | | | | | | |  |
|  | **OR** | | | | | | | | |  |
|  | Two slits are made one millimetre apart and the screen is placed one metre away. Light of wavelength 500 nm is used in the given setup. What should the width of each slit be to obtain 10 maxima of the double slit pattern within the central maximum of the single slit pattern? | | | | | | | | |  |

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