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PART – III

, awgpay; / PHYSICS

(English Version)

Time Allowed : 3.00 Hours] [Maximum Marks : 70

Instructions : (1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

(2) Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams.

PART – I

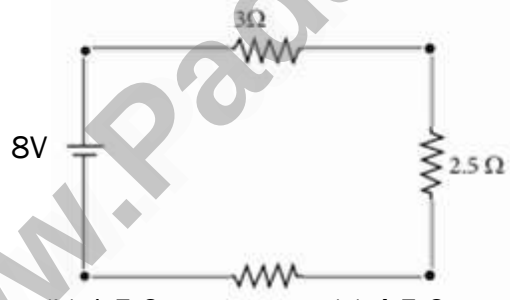
Note : (i) Answer **all** the questions. 15x1=15

(ii) Choose the most appropriate answer from the given four alternatives and write the **option code** and the **corresponding answer**.

1. If the magnitude of the magnetic field is 3×10^{-6} T, then magnitude of the electric field for a electromagnetic waves is

(a) 600 Vm^{-1} (b) 100 Vm^{-1} (c) 900 Vm^{-1} (d) 300 Vm^{-1}

2. There is a current of 1.0 A in the circuit shown below. What is the resistance of P?



(a) 3.5 Ω (b) 1.5 Ω (c) 4.5 Ω (d) 2.5 Ω

3. In which of the following sequences are the electromagnetic radiations in decreasing order of wavelength

(a) Infrared, radio, X-rays, visible (b) Radio, infrared, visible, X-rays

(c) Radio, visible, infrared, X-rays (d) X-rays, visible, infrared, radio

4. The reciprocal of resistance is

(a) conductance (b) resistivity (c) conductivity (d) none of the above

5. For light incident from air on a slab of refractive index 2, the maximum possible angle of refraction is,

(a) 30^0 (b) 45^0 (c) 60^0 (d) 90^0

[Turn Over

6. A wire of length 1 m moves with a speed of 10 ms^{-1} perpendiculars to a magnetic field. If the emf induced in the wire is 1V, the magnitude of the field is

(a) 0.01 T (b) 0.1 T (c) 0.2 T (d) 0.02 T

7 The image formed by an objective of a compound microscope is

(a) real and diminished (b) real and enlarged

(c) virtual and enlarged (d) virtual and diminished

8. If voltage applied on a capacitor is increased from V to 2V, choose the correct conclusion.

(a) Q remains the same, C is doubled (b) Q is doubled, C doubled

(c) C remains same, Q doubled (d) Both Q and C remain same

9. A circular coil of radius 5 cm and 50 turns carries a current of 3 ampere. The magnetic dipole moment of the coil is

(a) 1.0 amp-m^2 (b) 1.2 amp-m^2 (c) 0.5 amp-m^2 (d) 0.8 amp-m^2

10. The vertical component of Earth's magnetic field at a place is equal to the horizontal component. What is the value of angle of dip at this place?

(a) 30^o (b) 45^o (c) 60^o (d) 90^o

11. The potential energy of magnetic dipole whose dipole moment is $\vec{p}_m = (-5\hat{\imath} + 0.4\hat{\jmath})$ Am^2 kept in uniform magnetic field $\vec{B} = 0.2\hat{\imath}$

(a) –0.1 J (b) –0.8 J (c) 0.1 J (d) 0.8 J

12. $\frac{20}{\pi^2}$ H inductor is connected to a capacitor of capacitance C. The value of C in order to impart maximum power at 50 Hz is

(a) 50 μF (b) 0.5 μF (c) 500 μF (d) 5 μF

13. When the current changes from +2A to −2A in 0.05 s, an emf of 8 V is induced in a coil. The co-efficient of self-induction of the coil is

(a) 0.2 H (b) 0.4 H (c) 0.8 H (d) 0.1 H

14. Two metallic spheres of radii 1 cm and 3 cm are given charges of -1×10^{-2} C and 5×10^{-2} C respectively. If these are connected by a conducting wire, the final charge on the bigger sphere is

(a) 3×10^{-2}C (b) 4×10^{-2}C (c) 1×10^{-2}C (d) 2×10^{-2}C

15. Parallel plate capacitor stores a charge Q at a voltage V. Suppose the area of the Parallel plate capacitor and the distance between the plates are each doubled then which is the quantity that will change?

(a) Capacitance (b) Charge (c) Voltage (d) Energy density

PART – II

Note : Answer **any six** questions. Question No. **24** is **compulsory.** 6x2=12

16. Define electrostatic shielding.
17. Define electric dipole moment. Give its unit.
18. What are the properties of the substance used as heating element?
19. How the current sensitivity of galvanometer can be increased?
20. State Coulomb's inverse square law of magnetism.
21. State Fleming's right hand rule.
22. Define displacement current.
23. Explain the reason for the glittering of diamond.
24. A series RLC circuit which resonates has 80 μH inductor, 2000 pF capacitor and 50 Ω resistor. Calculate Q-factor of the circuit.

PART – III

Note : Answer **any six** questions. Question No. **33** is **compulsory.** 6x3=18

25. Give the applications and disadvantage of capacitors.
26. Derive the relation between the drift velocity and the current.
27. Give the properties of Lorentz magnetic force.
28. How Galvanometer can be converted in to Ammeter.
29. Explain various energy losses in a transformer.
30. How will you induce an emf by changing the area enclosed by the coil.
31. What are Fraunhofer lines? How are they useful in the identification of elements present in the Sun?
32. What is optical path? Write down the equation for optical path and mention, what each term represents.
33. The rod given in the figure is made up of two different materials

Both have square cross sections of 3 mm side. The resistivity of the first material is 4×10^{-3} Ωm and that of second material has resistivity of 5×10^{-3} Ωm. What is the resistance of rod between its ends?

PART – IV

Note : Answer **all** the questions. 5x5=25

34. (a) Calculate the electric field due to a dipole on its equatorial line.

(OR)

(b) Explain in detail the construction and working of Van de Graff generator.

35. (a) Obtain the macroscopic form of ohm's law from its microscopic form and discuss its limitation.

(OR)

(b) Obtain the condition for bridge balance in Wheatstone's bridge.

36. (a) Obtain a force between two long parallel current carrying conductors.

(OR)

(b) Deduce the relation for magnetic induction at a point due to an infinitely long straight conductor carrying current.

37. (a) Explain the principle, construction and working of transformer.

(OR)

(b) Derive an expression for phase angle between the applied voltage and current in a series RLC circuit.

38. (a) Explain the properties of electromagnetic waves.

(OR)

(b) Derive the mirror equation and the equation for lateral magnification.

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