

No. of Printed Pages : 4

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**PART – III**, aw:gpai; / **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.

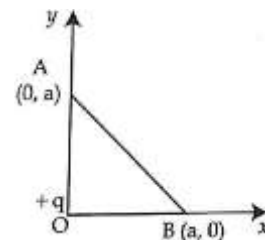
- The frequency range of 30 MHz to 400 GHz is used for :
  - Satellite communication
  - Ground wave propagation
  - Space wave propagation
  - Sky wave propagation
- In an oscillating LC circuit, the maximum charge on the capacitor is Q. The charge on the capacitor when the energy is stored equally between the electric and magnetic field is :
  - Q
  - $\frac{Q}{2}$
  - $\frac{Q}{\sqrt{3}}$
  - $\frac{Q}{\sqrt{2}}$
- Type of material which emits white light in LED :
  - GaN
  - SiC
  - AlGaP
  - GaAsP
- The force experienced by a particle having mass m and charge q accelerated through a potential difference V when it is kept under perpendicular magnetic field  $\vec{B}$  is
  - $\sqrt{\frac{2q^3BV}{m}}$
  - $\sqrt{\frac{q^3B^2V}{2m}}$
  - $\sqrt{\frac{2q^3BV}{m^3}}$
  - $\sqrt{\frac{2q^3B^2V}{m}}$
- Charging current for a capacitor is 0.2 A, find the displacement current.
  - zero
  - 0.2 A
  - 0.4 A
  - 0.1 A
- In Bohr Atom Model when the principal quantum number (n) increases the velocity of electron :
  - increases and then decreases
  - increases
  - decreases
  - remains constant
- In the given diagram a point charge +q is placed at the origin O. Work done in taking another point charge - Q from point A to point B is:

(a)  $\frac{qQ}{4\pi\epsilon_0 a^2} \left(\frac{a}{\sqrt{2}}\right)$

(b) zero

(c)  $\left[\frac{-qQ}{4\pi\epsilon_0} \frac{1}{a^2}\right] \sqrt{2}a$

(d)  $\left[\frac{qQ}{4\pi\epsilon_0} \frac{1}{a^2}\right] \sqrt{2}a$

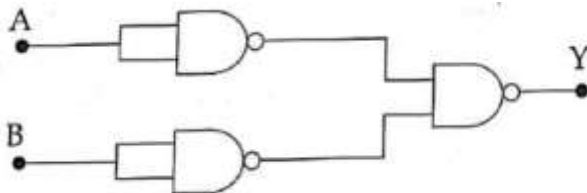


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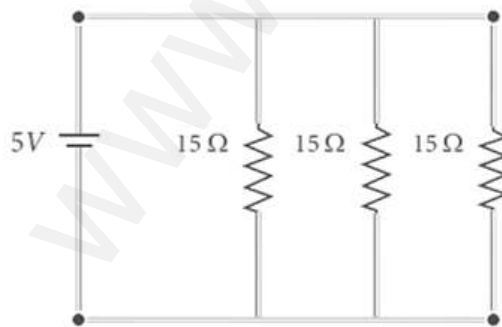
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8. The nucleus is approximately spherical in shape. Then the surface area of nucleus having mass number  $A$  varies as
- (a)  $A^{\frac{5}{3}}$  (b)  $A^{\frac{2}{3}}$  (c)  $A^{\frac{4}{3}}$  (d)  $A^{\frac{1}{3}}$
9. Two light waves from slit  $S_1$  and  $S_2$  on reaching points  $P$  and  $Q$  on a screen in Young's double slit experiment have a path difference zero and  $\frac{\lambda}{4}$  respectively. The ratio of light intensities at  $P$  and  $Q$  will be :
- (a) 4 : 1 (b) 3 : 2 (c)  $\sqrt{2} : 1$  (d) 2 : 1
10. The radius of curvature of curved surface at a thin Plano convex lens is 10 cm and the refractive index is 1.5. If the plane surface is silvered, then the focal length will be,
- (a) 20 cm (b) 5 cm (c) 10 cm (d) 15 cm
11. The given electrical network is equivalent to :



- (a) NAND gate (b) OR gate (c) NOT gate (d) Ex-OR gate
12. Magnetic field at any point at a distance  $R$  due to a long straight conductor carrying current varies as :
- (a)  $R^2$  (b)  $R$  (c)  $\frac{1}{R^2}$  (d)  $\frac{1}{R}$
13. If voltage applied on a capacitor is increased from  $V$  to  $2V$ , choose the correct conclusion.
- (a) Both  $Q$  and  $C$  remain the same (b)  $Q$  remains the same,  $C$  is doubled  
 (c)  $Q$  is doubled,  $C$  is doubled (d)  $C$  remains the same,  $Q$  is doubled
14. A light of wavelength 500 nm is incident on a sensitive plate of photoelectric work function 1.235 eV. The kinetic energy of the photo electrons emitted is :  
 (Take  $h = 6.6 \times 10^{-34}$  Js)
- (a) 1.16 eV (b) 0.58 eV (c) 2.48 eV (d) 1.24 eV
15. What is the current drawn out from the battery?



- (a) 4A (b) 1A (c) 2A (d) 3A

**PART – II**

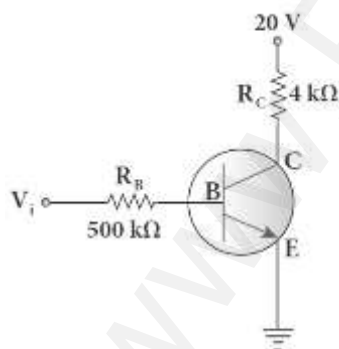
**Note :** Answer **any six** questions. Question No. **24** is **compulsory**. **6x2=12**

16. What do you mean by doping?
17. What are the uses of X-rays?
18. An ideal transformer has 460 and 40,000 turns in the primary and secondary coils respectively. Find the voltage developed per turn of the secondary coil if the transformer is connected to a 230 V AC main.
19. Distinguish between Fresnel and Fraunhofer types of diffraction.
20. What is corona discharge?
21. What is skip area?
22. What are the properties of neutrino?
23. Two materials X and Y are magnetized whose intensity of magnetization are  $500 \text{ Am}^{-1}$  and  $2000 \text{ Am}^{-1}$  respectively. The magnetizing field is  $1000 \text{ Am}^{-1}$ . What is the ratio between the susceptibilities of the two material?
24. Why electron is preferred over X-ray in microscope?

**PART – III**

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

25. Explain the conversion of galvanometer into voltmeter.
26. The resistance of a nichrome wire at  $0^\circ \text{C}$  is  $10\Omega$ . If its temperature coefficient of resistance is  $0.004/^\circ\text{C}$ , find its resistance at boiling point of water. Comment on the result.
27. What are the important inferences from the average binding energy curve?
28. In the circuit shown in the figure, the input voltage  $V_i$  is 20 V,  $V_{BE} = 0 \text{ V}$  and  $V_{CE} = 0 \text{ V}$ . What are the values of  $I_B$ ,  $I_C$ ,  $\beta$ ?



29. Derive the expression for equivalent capacitance, when capacitors are connected in parallel.
30. What are the advantages and disadvantages of AC over DC?
31. Two light sources of equal amplitudes interfere with each other. Calculate the ratio of maximum and minimum intensities.
32. Derive an expression for de-Broglie wavelength of electrons.
33. Modulation helps to reduce the antenna size in wireless communication – Explain.

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**PART – IV**

**Note :** Answer **all** the questions.

**5x5=25**

34. (a) Obtain the expression for the induced emf by changing relative orientation of the coil with the magnetic field (Graph not necessary?)

**(OR)**

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

35. (a) Deduce the expression for the force between two long parallel current carrying conductors.

**(OR)**

(b) Write down Maxwell equations in integral form.

36. (a) Describe Davission – Germer experiment which demonstrated the wave nature of Electrons.

**(OR)**

(b) (i) Derive an expression for the orbital energy of an electron in hydrogen atom using Bohr theory.

(ii) An electron in Bohr's hydrogen atom has an energy of  $-3.4$  eV. What is the angular momentum of the electron?

37. (a) Explain the working of the transistor as an oscillator.

**(OR)**

(b) Find out the phase relationship between voltage and current in a pure inductive circuit.

38. (a) State Gauss Law in electrostatics. Obtain an expression for Electric field due to an infinitely long charged wire.

**(OR)**

(b) How the emf of two cells compared using potentiometer?

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