

**FIRST REVISION EXAMINATION 2019-20**

Time Allowed : 3.00 Hours]

**PHYSICS**

[Max. Marks : 70

INSTRUCTION: 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 pencil to draw diagrams.

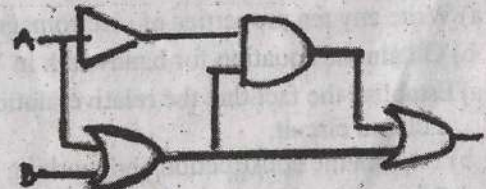
**PART - I**

Note: (i) Answer all the questions

15 × 1 = 15

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

- Assume Earth and moon are conductors. They are connected by a thin conducting wire. A change of +Q is introduced on Earth's surface. The ratio of the surface charge density of moon with earth  $\frac{\sigma_{\text{moon}}}{\sigma_{\text{earth}}} = 3.68$  using the above given data choose the correct option.  
a)  $R_E = 3.68 R_M$       b)  $R_E = R_M$       c)  $R_E = 7.3 R_M$       d)  $R_E = 60 R_M$
- 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 the same, Q is doubled      d) Both Q and C remain same
- A toaster operating at 240V has a resistance of 120Ω. The power is  
a) 400W      b) 2W      c) 480W      d) 240W
- The magnetic length of a uniform bar magnet if the geometrical length of the magnet is 12Cm.  
a) 10Cm      b) 12Cm      c) 8Cm      d) 0.1Cm
- The horizontal component of Earth's magnetic field is 0.2 gauss and total magnetic field is 0.4 gauss, then the angle of dip is  
a) 30°      b) 45°      c) 60°      d) 90°
- A capacitor of the capacitance  $\frac{10^2}{\pi} \mu F$  is connected across a 220V, 50Hz A.C mains. The capacitive reactance is  
a) 400Ω      b) 400Ω      c) 300Ω      d) 100Ω
- If  $\lambda_v, \lambda_x, \lambda_m$  represent the wavelengths of visible light, X-rays and microwaves respectively, then  
a)  $\lambda_m > \lambda_x > \lambda_v$       b)  $\lambda_v > \lambda_m > \lambda_x$       c)  $\lambda_m > \lambda_v > \lambda_x$       d)  $\lambda_v > \lambda_x > \lambda_m$
- A ray of light strikes a glass plate at an angle 60°. If the reflected and refracted rays are perpendicular to each other, the refractive index of the glass is,  
a)  $\sqrt{3}$       b) 3/2      c)  $\sqrt{3}/2$       d) 2
- Two thin lens of power +5D and -2D are put in contact with each other. Focal length of the combination is,  
a) +3m      b) +0.33m      c) -3m      d) -0.33m
- The momentum of a photon of energy 1MeV in kgms<sup>-1</sup> is  
a)  $10^{-22}$       b)  $0.33 \times 10^6$       c)  $7 \times 10^{-24}$       d)  $5 \times 10^{-22}$
- The mass of a  ${}^7_3\text{Li}$  nucleus is 0.042 u less than the sum of the masses of all its nucleons. The binding energy per nucleon of  ${}^7_3\text{Li}$  nucleus is nearly  
a) 46 MeV      b) 5.6 MeV      c) 3.9 MeV      d) 23 MeV
- The output Boolean expression for the given circuit is,  
a) AB      b) A+B      c)  $\bar{A}+B$       d)  $A + \bar{B}$



- The forbidden energy gap of an LED material is 3.0eV. the wavelength of the light emitted by it is  
a)  $6.6 \times 10^{-7}m$       b)  $5.12 \times 10^{-7}m$       c)  $4.14 \times 10^{-7}m$       d)  $3.2 \times 10^{-7}m$

14. The variation of frequency of carrier wave with respect to the amplitude of the modulating signal is called ———
- (a) Amplitude modulation (b) Frequency modulation  
(c) Phase modulation (d) Pulse with modulation
15. An example for nano-scale structure existing in nature is
- a) Lotus leaves b) Wings of a morpho butterfly c) Peacock feathers d) all of these

#### PART - II

Answer any six questions and question No.24 is compulsory

6 × 2 = 12

16. A sample of HCl gas is placed in a uniform electric field of magnitude  $3 \times 10^4 \text{ NC}^{-1}$ . The dipole moment of each HCl molecule is  $3.4 \times 10^{-30} \text{ Cm}$ . Calculate the maximum torque experienced by each HCl molecule.
17. What is electric power and electric energy?
18. What is Meissner effect?
19. A coil of 200 turns carries a current of 4A. If the magnetic flux through the coil is  $6 \times 10^{-5} \text{ Wb}$ , find the magnetic energy stored in the medium surrounding the coil.
20. What is meant by Fraunhofer lines?
21. State Brewster's law.
22. What is Barkhausen condition for sustained oscillations?
23. Define curie.
24. How many photons of frequency  $10^{14} \text{ Hz}$  will make up 19.86J of energy?

#### PART - III

Answer any six questions and question No.33 is compulsory

6 × 3 = 18

25. Derive the expression for resultant capacitance when capacitors are connected in series.
26. Two cells each of 5V are connected in series across a  $8\Omega$  resistor and three parallel resistors of  $4\Omega$ ,  $6\Omega$  and  $12\Omega$ . Draw the circuit diagram for the above arrangement. Calculate (i) the current drawn from the cell (ii) current through each resistor
27. Discuss the conversion of galvanometer into an ammeter.
28. Mention the various energy losses in a transformer.
29. A diffraction grating consisting of 4000 slits per centimeter is illuminated with a monochromatic light that produces the second order diffraction at an angle of  $30^\circ$ . What is the wavelength of the light used?
30. State and prove De Morgan's First and Second theorems.
31. Derive an expression for de Broglie wavelength of electrons.
32. Discuss the applications of Nano materials in various fields.
33. Calculate the time required for 60% of a sample of radon undergo decay. Given  $T_{1/2}$  of radon = 3.8 days.

#### PART - IV

Answer all the questions.

5 × 5 = 25

34. a) Calculate the electric field due to a dipole on its axial line. (OR)  
b) Deduce the relation for the magnetic induction at a point due to an infinitely long straight conductor carrying current.
35. a) (i) Obtain the condition for bridge balance in Wheatstone's bridge.  
(ii) In a Wheatstone's bridge  $P = 100\Omega$ ,  $Q = 1000\Omega$  and  $R = 40\Omega$ . If galvanometer shows zero deflection, determine the value of S. (OR)  
b) Obtain Eintien's photoelectric equation with necessary explanation.
36. a) Write any ten properties of electromagnetic waves. (OR)  
b) Obtain the equation for bandwidth in Young's double slit experiment
37. a) Establish the fact that the relative motion between the coil and the magnet induces an emf in the coil of a closed circuit. (OR)  
b) Explain the construction and working of a full wave rectifier.
38. a) Discuss the spectral series of hydrogen. (OR)  
b) Elaborate on the basic elements of communication system with the necessary block diagram.