

Part - III

- Note :** (i) Answer the question 60 compulsory. (07 X 0 5 = 35)
 (ii) Of the remaining 11 questions, answer any six questions.
 (iii) Draw diagrams wherever necessary.

- 51) Obtain an expression for electric field at a point due to a point charge.
 52) The resistance of a copper wire of length 5m is 0.5 Ω . If the diameter of the wire is 0.05cm, determine its specific resistance.
 53) Explain the reactions at the electrodes of Daniel cell.
 54) Explain how will you convert a galvanometer into an ammeter.
 55) Derive an expression for the average power in an a.c circuit.
 56) Write a note on Nicol prism.
 57) Explain Coolidge tube to produce X- rays
 58) The time interval measured by an observer at rest is 2.5×10^{-8} s. What is the time interval as measured by an observer moving with velocity $v=0.73c$.
 59) Explain length contraction.
 60) Show that the mass of radium (${}_{88}\text{Ra}^{226}$) with an activity of 1curie is almost a gram. (Given $T_{1/2}=1600$ years, 1curie = 3.7×10^{10} disintegrations per second) (Or)
 Calculate the time required for 60% of a sample of radon to undergo decay. (Given $T_{1/2}$ of radon = 3.8 days)
 61) Explain the action of operational amplifier as inverting amplifier.
 62) Explain with block diagram super heterodyne FM radio receiver.

Part - IV

- Note :** (i) Answer any four questions in detail. (04 X 10 = 40)
 (ii) Draw diagrams wherever necessary.

- 63) State Gauss's law. Applying this, calculate electric field due to
 i) an infinitely long straight charged wire with uniform charge density.
 ii) an infinite plane sheet of charge.
 64) State Joule's law of heating. Explain Joule's calorimeter experiment to verify Joule's law.
 65) Explain in detail the principle, construction and theory of a transformer. Define its efficiency. Mention the losses.
 66) Explain Raman scattering with the help of energy level diagram.
 67) How will you determine the wavelength of X- rays using Bragg spectrometer? Write any five properties of X-rays.
 68) State the radioactive law of disintegration. Obtain an expression to deduce the amount of the radioactive substance present at any instant. Obtain the relation between half-life period and decay constant.
 69) Explain in detail the feedback amplifier with circuit diagram. Mention the advantages of negative feedback.
 70) Make an analysis of amplitude modulated wave. Plot the frequency spectrum.

Register Number: **PART - III****PHYSICS MODEL QUESTION -4****Time Allowed: 03:00 Hours]****Maximum Marks: 150]****Instructions:**

- i) Check the Question Papers for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.
 ii) Use **Black or Blue ink** to write and **Pencil** to draw diagrams.

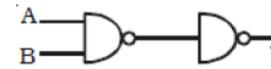
Part - I**Note: (i) Answer all the questions (30 X 01 = 30)**

- (ii) Choose the correct answer
 (iii) Each question carries one mark.

- 01) Two point charges +q and -q are placed at points A and B respectively separated by a small distance. The electric field intensity at the midpoint O of AB
 a) is zero b) acts along AB c) acts along BA d) acts perpendicular to AB
 02) n capacitors each of capacitance C are connected in series. The effective capacitance is
 a) n/C b) C/n c) nC d) C
 03) If two capacitors of capacitance $2\mu\text{F}$ and $6\mu\text{F}$ are put in series, the effective capacitance of the system is
 a) $8\mu\text{F}$ b) $2\mu\text{F}$ c) $3/2\mu\text{F}$ d) $2/3\mu\text{F}$
 04) A glass rod rubbed with silk acquires a charge of $+8 \times 10^{-12}$ C. The number of electrons it has gained or lost
 a) 5×10^{-7} (gained) b) 5×10^7 (lost) c) 2×10^{-8} (lost) d) -8×10^{-12} (lost)
 05) When two $\beta\Omega$ resistances are in series, the effective resistance is
 a) $\beta\Omega$ b) 4Ω c) 1Ω d) 0.5Ω
 06) The torque experienced by a rectangular current loop placed perpendicular to a uniform magnetic field is
 a) zero b) finite maximum c) maximum d) infinity
 07) A current of 2A flows through two long straight parallel conductors separated by a distance of 10 cm. The force per unit length on each conductor is
 a) 0.0458N b) 8×10^{-4} N c) 8×10^{-5} N d) 8×10^{-6} N
 08) Which of the following devices does not allow d.c to pass through?
 a) resistor b) capacitor c) inductor d) all the above
 09) The self inductance of a straight conductor is
 a) zero b) infinity c) very large d) very small
 10) The average power consumed over one cycle in an ac circuit is
 a) $E_{\text{rms}} I_{\text{rms}} \cos\phi$ b) $E_{\text{rms}} I_{\text{rms}} \sin\phi$ c) $E_{\text{rms}} I_{\text{rms}}$ d) $E_0 I_0 \cos\phi$
 11) A 50 mH coil carries a current of 4 ampere. The energy stored is
 a) 0.4 J b) 4.0 J c) 0.8 J d) 0.04 J

- 12) Electromagnetic waves are
 a) transverse b) longitudinal
 c) may be longitudinal or transverse
 d) neither longitudinal nor transverse
- 13) In Newton's ring experiment if the radii of m^{th} and $(m+4)^{\text{th}}$ dark rings are $\sqrt{5}$ mm and $\sqrt{7}$ mm respectively then the value of 'm' is
 a) 2 b) 4 c) 8 d) 10
- 14) Which of the following does not support the wave nature of light?
 a) interference b) diffraction c) polarization d) photoelectric effect
- 15) Which of the following have minimum wavelength?
 a) γ rays b) x-rays c) Cosmic rays d) Ultra violet rays
- 16) The ratio of the radii of the first three Bohr orbit is
 a) $1 : \frac{1}{2} : \frac{1}{3}$ b) $1 : 2 : 3$ c) $1 : 4 : 9$ d) $1 : 8 : 27$
- 17) A narrow electron beam passes un deviated through an electric field $E=3 \times 10^4$ V/m and an overlapping magnetic field $B=2 \times 10^{-3}$ Wb/m². The electron motion, electric field and magnetic field are mutually perpendicular. The speed of the electron is
 a) 60ms^{-1} b) $10.3 \times 10^7 \text{ms}^{-1}$ c) $1.5 \times 10^7 \text{ms}^{-1}$ d) $0.67 \times 10^{-7} \text{ms}^{-1}$
- 18) To increase the penetrating power of x-rays in a Coolidge tube
 a) Temperature of cathode should be increased
 b) pressure of gas should be increased
 c) accelerating potential should be increased d) all of these
- 19) In hydrogen atom, which of the following transitions produce a spectral line of maximum frequency?
 a) $2 \rightarrow 1$ b) $6 \rightarrow 2$ c) $4 \rightarrow 3$ d) $5 \rightarrow 1$
- 20) The photoelectric effect can be explained on the basis of
 a) corpuscular theory of light b) wave theory of light
 c) electromagnetic theory of light d) quantum theory of light
- 21) The minimum amount of energy required to liberate an electron from the metal is called
 a) cut off potential b) critical potential
 work function d) ionization potential
- 22) The binding energy per nucleon of ${}_{26}\text{Fe}^{56}$ nucleus is
 a) 8.8 MeV b) 88 MeV c) 493 MeV d) 41.3 MeV
- 23) The value of 1 amu is
 a) 931 eV b) mass of carbon atom
 c) mass of 1 proton d) 1.66×10^{-27} kg
- 24) The ionization power is maximum for
 a) Neutrons b) α -particles c) γ -rays d) β -particles
- 25) Average number of neutrons released per fission of uranium is
 a) 2 b) 3 c) 2.5 d) 3.5
- 26) The forbidden energy gap for germanium is of the order of
 a) 1.1 eV b) 0.7 eV c) 0.3 eV d) 10 eV
- 27) An oscillator is
 a) an amplifier with feedback b) a convertor of ac to dc energy
 c) nothing but an amplifier d) an amplifier without feedback

- 28) The following arrangement performs the logic function of _____ gate



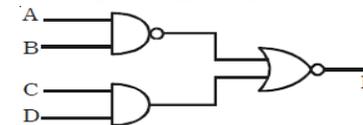
- a) AND b) OR c) NAND d) EXOR
- 29) Vidicon functions on the principle of
 a) photosensitivity b) photoconductivity
 c) photo electricity d) photo resistivity
- 30) The greatest technical problem in analog communication
 a) noise b) nature of signal c) wider band width d) power of system

Part – II

Note : Answer any fifteen questions.

(15 X 03 = 45)

- 31) What is non- polar molecule? Give two examples.
- 32) What is meant by dielectric polarization?
- 33) The resistance of a platinum wire at 0°C is 4Ω . What will be the resistance of the wire at 100°C if the temperature coefficient of resistance of platinum is $0.0038/^\circ\text{C}$
- 34) Why copper wire is not suitable for potentiometer?
- 35) Distinguish between electric power and electric energy.
- 36) Mention the limitations of cyclotron.
- 37) State Fleming's right hand rule.
- 38) A solenoid of length 1m and 0.05 m diameter has 500 turns. If a current of 2A passes through the coil, Calculate the coefficient of self induction of the coil.
- 39) Give the conditions for sustained interference.
- 40) Why the center of the Newton's ring dark?
- 41) Calculate the longest wavelength that can be analyzed by a rock sale crystal of spacing $d = 2.82 \text{ \AA}$ in the first order.
- 42) What is meant by normal population?
- c) 43) The photoelectric threshold wavelength of a metal is 5000 \AA . Find the work function in eV
- 44) Calculate the radius of ${}_{13}\text{Al}^{27}$ nucleus
- 45) Distinguish between uncontrolled and controlled chain reaction
- 46) Draw the circuit configuration of NPN transistor in common collector (CC) mode.
- 47) Distinguish between linear and digital ICs.
- 48) Give the Boolean equation for the given logic diagram



- 49) What are the three different methods of doping a semiconductor?
- 50) What is meant by skip distance?