

**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  $\Omega$ . 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  $2.5 \times 10^{-8}$  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 =  $3.7 \times 10^{10}$  disintegrations per second ) (Or)  
Calculate the time required for 60% of a sample of radon to under go decay. (Given  $T_{1/2}$  of radon =3.8days)
- 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**

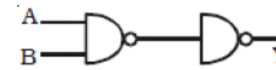
**Note: (i) Answer all the questions (30 X 01 = 30 )**

- (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  $+8 \times 10^{-12}\text{C}$ . The number of electrons it has gained or lost  
a)  $5 \times 10^{-7}$  (gained) b)  $5 \times 10^7$  (lost) c)  $2 \times 10^{-8}$  (lost) d)  $-8 \times 10^{-12}$  (lost)
- 05) When two  $\beta\Omega$  resistances are in series, the effective resistance is  
a)  $\beta\Omega$  b)  $4\Omega$  c)  $1\Omega$  d)  $0.5\Omega$
- 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)  $8 \times 10^{-4}\text{N}$  c)  $8 \times 10^{-5}\text{N}$  d)  $8 \times 10^{-6}\text{N}$
- 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  $m^{\text{th}}$  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)  $\gamma$  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 undeviated through an electric field  $E=3 \times 10^4$  V/m and an overlapping magnetic field  $B=2 \times 10^{-3}$  Wb/m<sup>2</sup>. The electron motion, electric field and magnetic field are mutually perpendicular. The speed of the electron is  
 a)  $60 \text{ms}^{-1}$     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)  $1.66 \times 10^{-27}$  kg
- 24) The ionization power is maximum for  
 a) Neutrons    b)  $\alpha$ -particles    c)  $\gamma$ -rays    d)  $\beta$ -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



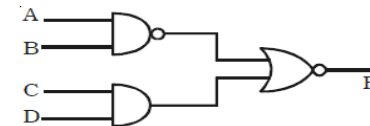
- a) AND                      b) OR                      c) NAND                      d) EXOR
- 29) Vidicon functions on the principle of  
 a) photosensitivity                              b) photoconductivity  
 c) photo electricity                              d) photo resistivity
- 30) The greatest 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  $0^\circ\text{C}$  is  $4\Omega$ . What will be the resistance of the wire at  $100^\circ\text{C}$  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 salt 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  $5000 \text{ \AA}$ . 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?