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) Which of the following quantities is scalar?
   a) Dipole moment   b) electric force   c) electric field   d) electric flux

02) A dipole is placed in a uniform electric field with its axis parallel to the field. It experiences
   a) Only a net force   b) only a torque
   c) both a net force and torque   d) neither a net force nor a torque

03) The capacitance of a parallel plate capacitor increases from 6µf to 60µf when a dielectric is filled between the plates. The dielectric constant of the dielectric is
   a) 65   b)55   c) 12   d)10

04) Water is an excellent solvent because its molecules are
   a) neutral   b)highly polar   c) non-polar   d) anodes

05) A material with negative temperature coefficient of resistance is called
   a) metal   b)alloy   c) thermistor   d) thermometer

06) When an ammeter is connected in parallel, the resistance of the circuit is
   a) increased   b)decreased   c) unchanged   d) none of the above

07) An electron is moving with a velocity of $3x10^6 ms^{-1}$ perpendicular to a uniform magnetic field of induction 0.5T. The force experienced by the electron
   a) $2.4x\ 10^{-13}N$ b) $13.6\ x10^{-27}N$ c) $13.6x\ 10^{-11}N$ d) zero

08) Eddy current do not cause
   a) damping   b)heating   c) sparking   d) loss of energy

09) Transformer works on
   a) AC only   b) DC only   c) both AC and DC   d) AC more effectively than DC

10) A magnet is moved towards a coil (i)quickly, (ii)slowly. Then the induced emf is
   a) larger incase (i) b) smaller incase(i) c) equal in both cases d) cannot say

11) A coil has self inductance of 0.02H. Calculate the value of induced emf when the current in the coil is changing at the rate of $150 As^{-1}$
   a) 30volt   b)300volt   c) 3 volt   d)0.3 volt

12) Atomic spectrum should be
   a) pure line spectrum   b) emission band spectrum
   c) absorption line spectrum   d) absorption band spectrum

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54) Two parallel wires each of length 5mare placed at a distance of 10 cm apart in air. They carry equal currents along the same direction and experience a mutually attractive force of $3.6x\ 10^{-4}N$. Find the current through the conductors   (Or)
   A circular coil of radius 20cm has 100 turns of wire and it carries a current of 5A. Find the magnetic induction at appoint a long its axis at a distance of 20 cm from the center of the coil.

55) Obtain an expression for these If inductance of a long solenoid

56) In Young's experiment a light of frequency $6x10^{14}Hz$ is used. Distance between the centres of adjacent fringes is 0.75mm. Calculate the distance between the slits, if the screen is 1.5 m away

57) Write any five properties of cathode rays
58) Write any five applications of photocells
59) Derive Einstein's photo electric equation
60) Explain Soddy–Fajan's radioactive displacement law
61) Explain the action of operational amplifier as summing amplifier
62) Give the merits and demerits of satellite communication

Part – IV

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

63)   What is an electric dipole? Derive an expression for the electric field due to an electric dipole at a point on its axial line

64) Deduce an expression for the magnetic induction due to an infinitely long straight conductor carrying current. Write the expression for the magnetic induction when the conductor is placed in a medium of permeability µ

65) Obtain an expression for the current flowing in a circuit containing capacitance only. Find the phase relationship between voltage and current.

66) Explain Raman scattering with the help of energy level diagram.

67) Describe the J.J.Thomson method to determine the specific charge of electron.

68) What is nuclear reactor? Explain the functions of (i) moderator (ii) control rods and (iii) neutron reflector Mention the uses of nuclear reactor. Diagram not necessary.

69) Sketch the circuit of Colpitt's oscillator and explain its working.

70) With the help of block diagram explain the function of a monochrome TV reception.

13) Radiation used to destroy bacteria and for sterilizing surgical instruments are
   a) radio waves   b) X-rays   c) UV radiations   d) gamma rays

14) In Raman effect if the scattered photon gains energy, it gives rise to
   a) Stokes line   b) anti stokes lines
   c) stokes lines and anti stroke's lines   d) Rayleigh's line

15) A wave front is an imaginary surface where
   a) phase is always same for all the points
   b) phase changes at constant rate in all directions
   c) constant phase difference is maintained
   d) phase changes at a rate which changes per unit length

16) The cathode rays are
   a) a stream of electrons   b) a stream of positive ions
   c) a stream of uncharged particles   d) the same as canal rays

17) 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

18) In an hydrogen atom, value of Bohr radius is
   a) 0.53×10^{-8}m   b) $53A^0$ c) $0.53A^0$ d) 530nm

19) The energy required to remove an electron from the first orbit of hydrogen atom to outside the atom is
   a) 136eV   b) 13.6V   c) 13.6eV   d) -13.6eV

20) If 2 kg of a substance is fully converted into energy, then the energy produced is
   a) 9×10^{16} J   b) 9×10^{24} J   c) 0 J   d) 18×10^{16} J

21) According to relativity, the length of a rod in motion
   a) is same as its rest length   b) is more than its rest length
   c) is less than its rest length
   d) may be more or less than or equal to rest length depending on the speed of the rod

22) The half life of radium is 1600years, after 4800years the un disintegrated amount of radium will be
   a)1 /8   b) 1 /10   c) 7 /8   d)8 /7

23) Mass of proton is ----------times the mass of electron.
   a) 2   b) 1836   c) 1636   d) 1863

24) The half life period of a certain radioactive element with disintegration constant 0.0693per day is
   a) 10 days   b)14 days   c) 140days   d)1.4days

25) The average energy released per fission is
   a) 200eV   b) 200 MeV   c) 200 meV   d) 200 GeV

26) If the forward voltage in a diode is increased, the width of depletion layer will
   a) decrease   b)increase   c) not change
   d) increase proportional to applied voltage

27) Improper biasing of a transistor circuit produces
   a) Heavy loading of emitter current   b) distortion in the output signal
   c) excessive heat at collector terminal   d) faulty location of load line

28) The value of α in transistor
   a) is always less than 1   b) is always greater than 1
   c) may be less or greater than 1   d) none of these

29) The modulating signal may be represented as
   a) $e_S= E_C \cos \omega_s t$ b) $e_S= E_S \cos \omega_s t$ c) $e_S= E_C \cos \omega_c t$ d)$e_S= E_S \cos \omega_c t$

30) Printed documents to be transmitted by fax are converted into electrical signals by the process of
   a) reflection   b)scanning   c) modulation   d) light variation

Part – II

Note : Answer any fifteen questions.   **(15 X 03 = 45)**

31) Calculate the potential at a point due to a chargeof4×10^{-7}C located at 0.09m away from it

32) Define electric flux. Give its unit.

33) Define electric current. Give its unit.

34) State Kirchhoff's first law

35) Name three changes observed in transition temperature.

36) Define Thomson co– efficient. Give its unit.

37) A coil of area of cross- section 0.5 m^2 with 10 turns is in a plane perpendicular to a uniform magnetic field of 0.2 Wb/m^2. Calculate the flux through the coil.

38) Distinguish between step-up & step- down transformer.

39) What are coherent sources?

40) Distinguish between interference and polarization.

41) Calculate the short wavelength limit of Lyman series.

42) Why ordinary plane transmission gratings cannot be used to produced if fraction effects in X–rays?

43) What is the de Broglie wavelength of electron of kinetic energy120eV?
   (h= 6.626×10^{-34}Js m= 9.1×10^{-31}kg)

44) What are cosmic rays?

45) Calculate the number of atom sin one gram of $_3Li^6$

46) What are logic gates?

47) What is an integrated circuit? Mention any two advantages.

48) Prove the Boolean identity   (A + B)(A+C)=A+BC

49) Draw the circuit for inverting amplifier.

50) What is meant by scanning?

Part – III

Note : (i) Answer the question 54 compulsory.   **(07 X0 5 = 35)**
          (ii) Of the remaining 11 questions, answer any six questions.
          (iii) Draw diagrams wherever necessary.

51) Derive an expression for the torque acting on the electric dipole when placed in the electric field.

52) Obtain the condition for zero deflection in Wheat stone's network.

53) State and verify Faraday's first law of electrolysis.