

- NB:** 1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Non programmable calculators are allowed.

Q.I Choose the correct alternative and rewrite (each one mark) (10)

- Radioactivity was discovered by:
a) Madam Curie b) H. Bequerel c) Rontgen d) None of the above
- Photoelectric effect exhibits:
a) Wave nature b) Particle nature c) Both wave and Particle Nature
d) None of the above
- X-rays are produced by:
a) Ionization of a gas b) Fast moving electrogms hitting & solid target
c) Photo electric effect d) Compton effect
- The efficiency of bridge rectifier is
a) 81.2% b) 82.1% c) 50% d) 100%
- In common emitter mode of a transistor all voltages are measured with vespect to:
a) Collector b) Emitter c) Base d) None of the above
- In Compton Effect the wavelength of incident radiation.
a) remain same b) increases c) decreases d) increases or decreases
- The value of 1 d. p. s is equal to
a) 1 bequerel b) 5 bequerel c) 7 bequerel d) 9 biquerel
- X-rays are:
a) Protons b) Matter waves c) Electromagnetic radiation d) Neutrons
- In Davisson Germer experiment the glancing angle is
a) 65° b) 56° c) 50° d) 96°
- A logic gate gives low output when any of its input is low. Then the gale is...
a) AND b) OR c) NAND d) NOT

Q.II (A) Attempt any one (4)

- Obtain the expression for the growth of current in a series L-R- circuit connected to a d.c. voltage source of constant e.m.f.
- Determine the current in a series L-C-R circuit connected to a source of alternating e.m.f. Hence obtain the condition for resonance in this circuit.

Q. II (B) Attempt ANY TWO (6)

- Give the theory of an ideal transformer. What are step-up and step-down transformers?
- What is meant by the term 'Time Constant' of a series C-R circuit? What is the minimum time needed to nearly complete the growth of current in this circuit.
- A 100 m H inductance is in series with a 100Ω resistance and an a.c. voltage source of frequency 1000 Hz, the input voltage is 2 volt peak. Find the coil reactance, the circuit impedance and r.m.s. current.

Q. III (A) Attempt ANY ONE (4)

- Show that when a charged particle moves perpendicular to a uniform magnetic field, its motion is along a circular path. Hence find an expression for the frequency of revolution of the particle.
- Define Electric potential. Show that $E = -\nabla\phi$

Q. III (B) Attempt ANY TWO (6)

- Write down expressions for the potential a) Collection of charges b) Continuous charge distribution over a volume c) Over a surface
- Define and explain vector operator Del.
- A uniformly charged spherical shell of radius R carries a total charge q. find the electrostatic potential at a point p out side shell.

Q. IV (A) Attempt ANY ONE

(4)

1. Describe, with a neat circuit diagram, the working of a bridge type rectifier.
2. State and prove De Morgan's Second Theorem.

Q. IV (B) Attempt ANY TWO

(6)

1. Define Ripple factor. Show that for a full wave rectifier value of ripple factor is 0.482.
2. Explain the working of a NPN transistor with the help of a neat diagram.
3. What is NOT gate? Prepare a truth table for two input NOT gate.

Q. V. (A) Attempt ANY ONE

(4)

1. Describe Millikan's oil drop method to find the charge on an electron. What does the experiment prove?
2. Give the theory of Bainbridge Mass spectrometer.

Q. V (B) Attempt Any TWO

(6)

1. Calculate the ionization potential for Hydrogen

Given: $e = 1.6 \times 10^{-19}C$, $m = 9.1 \times 10^{-31}kg$, $h = 6.63 \times 10^{-34}J.s$
 $ev = 1.6 \times 10^{-19}J$

2. State the properties of X-rays and its applications
3. Derive Bragg's law.

Q. VI (A) Attempt ANY ONE

(4)

1. Explain the concept of dual nature of matter and set up the equation for the wave length of matter waves in terms of a) Particle momentum and b) Energy.
2. State Heisenberg uncertainty principle relating the uncertainties in (a) position and momentum and b) Energy and time

Q. VI (B) Attempt ANY TWO

(6)

1. Explain the use of NOR gate as a basic building block.
2. Explain the process of carbon dating.
3. The half life of $^{24}_{11}Na$ is 16hrs. How long does it take for 93.75 percent of a sample of this isotope to decay?