

BSC. PART - II EXAMINATION - 2013

PHYSICS HONOURS PAPER III

Answer five questions in all selecting two questions each from Group A and Group B, in which Q. No. 1 is compulsory.

1. Select the correct choice of the following:

(a) If, $\vec{r} = x \vec{i} + y \vec{j} + z \vec{k}$ then value of $\vec{\nabla} \cdot \vec{r}$ is:

- (i) 0 (ii) 1 (iii) r (iv) 3

(b) Div grad S is equal to:

- (i) $\nabla^2 S$ (ii) Zero (iii) 1 (iv) 2

(c) A particle of rest mass m_0 moves with speed of $\frac{c}{\sqrt{2}}$, then its mass is equal to:

- (i) $m_0 \sqrt{2}$ (ii) $\frac{m_0}{\sqrt{2}}$ (iii) $m_0 \sqrt{3}$ (iv) $\frac{m_0}{\sqrt{3}}$

(d) The relativistic total energy E of a particle of rest mass m_0 is related to the linear

momentum P by: (i) $E = \frac{P}{C}$ (ii) $P = \frac{E}{C}$ (iii) $E = \frac{P^2}{C^2}$ (iv) $P = \frac{E^2}{C^2}$

(e) Rest mass of the electron is:

- (i) Greater than the mass of moving electron with high speed
(ii) Equal to the mass of the moving electron
(iii) Greater or less depending on the magnitude of velocity
(iv) Always less than the mass of moving electron.

(f) Silicon doped with phosphorus is known as: (i) n-type semiconductor

- (ii) p-type semiconductor (iii) Intrinsic semiconductor (iv) Insulator

(g) Transistor is regarded as a: (i) Four pole network

- (ii) Three pole network (iii) Two pole network (iv) None of these.

(h) Positive feedback is used in:

- (i) Rectifier (ii) Low gain amplifier (iii) Oscillator (iv) Modulator

(i) Decimal form of binary number 10111 is:

- (i) 24 (ii) 23 (iii) 22 (iv) 21

(j) An AND gate can be prepared by repetitive use of:

- (i) NOT gate (ii) OR gate (iii) NAND gate (iv) None of these

GROUP-A

2. State and prove Stoke's theorem. Explain line, surface and volume integrals.

3. Write down Laplace equation and obtain its solution in spherical polar co-ordinates.
4. State the postulates of special theory of relativity. Deduce Lorentz transformation equations.
5. Derive the expression for the variation of mass with velocity. Find the expression for the rest mass of a photon.

GROUP-B

6. Draw the circuit diagram of a full-wave rectifier and discuss its action. How is the filter circuit used for smoothing the rectifier output?
7. Describe the principle of a R-C coupled amplifier with proper circuit diagram. Derive the expression for the frequency gain.
8. (a) State and prove Thevenin's theorem.
(b) State Norton's theorem and prove it.
9. What are Logic Gates. Describe AND, NAND and NOR gates with their truth tables.

OR. Write notes on any two of the following:

- (a) Zener diode (b) J K flip-flops (c) Negative feed back (d) JFET