

# BSC. PART - II EXAMINATION - 2016

## PHYSICS HONOURS PAPER III

Q. No. I is compulsory. Answer two questions each from  
Group - A and Group - B.

I. Select the correct answer of the following :

(a) Curl of a vector is always :

- (i) A Scalar Field (ii) A Vector field  
(iii) Both Scalar and Vector field (iv) None of these

(b) Gauss's divergence theorem enables us to :

- (i) Transform a volume integral into time integral  
(ii) Transform a volume integral into surface integral  
(iii) Transform a surface integral into line integral (iv) None of these

(c) A particle of rest mass  $m_0$  moves with a 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) The set of co-ordinates required in spherical co-ordinates system is :

- (i)  $(r, \theta)$  (ii)  $(r, \theta, Z)$  (iii)  $(r, \theta, \phi)$  (iv)  $(x, y, z)$

(f) Zener diodes are used in :

- (i) Current-limiting circuit (ii) Voltage-limiting circuit  
(iii) Both voltage-limiting circuits and current limiting circuits  
(iv) None of these

(g) Silicon doped with phosphorus is known as :

- (i) p-type semi-conductor (ii) n-type semi-conductor  
(iii) Intrinsic semi-conductor (iv) Insulator

(h) Positive feedback is used in :

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

(i) Transistor is regarded as a :

- (i) Four pole network (ii) Three pole network  
(iii) Two pole network (iv) none of these

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

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

### GROUP - A

2. State and prove Gauss's divergence theorem.
3. Write Laplace's equation in cylindrical Co-ordinates and find its general solution.
4. Describe Michelson-Morley experiment with theory. How null result has been explained?
5. Use Lorentz transformation equations to discuss Length Contraction and time dilation. Hence explain, what do you understand by so called the turn paradox?

### GROUP - B

6. What is Barkhausen criterion of sustained oscillation? Discuss the working of a Hartley oscillator with necessary circuit diagram.
7. Draw the circuit diagram of a fullwave rectifier and discuss its action. How the filter circuit used for smoothing the rectifier output?
8. Explain, with a neat diagram, the Bipolar junction Transistor characteristic for common emitter configuration.
9. Write short notes on any two of the following :  
(a) JFET (b) p and n-types semiconductor  
(c) Amplitude modulation (d) J-K flip-flops

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