

Code: AE75 Subject: OPTOELECTRONICS AND COMMUNICATIONS

AMIETE - ET

Time: 3 Hours

JUNE 2013

Max. Marks: 100

**PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.**

**NOTE: There are 9 Questions in all.**

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

**Q.1 Choose the correct or the best alternative in the following: (2×10)**

a. Total internal reflection takes place when light travels from

- (A) Denser to rarer Medium                      (B) Rarer to Denser medium  
(C) Denser to Denser medium                  (D) Rarer to rarer medium

b. Which of the semiconductor can be used to fabricate a LED?

- (A) Si    (B) Ge  
(C) GaAs    (D) None of these

c. The relation between bandwidth (BW) and numerical aperture (NA) is

- (A)  $BW \propto NA$                                       (B)  $BW \propto \frac{1}{NA}$   
(C)  $BW \propto \frac{1}{(NA)^2}$                                 (D)  $BW \propto \frac{1}{(NA)^3}$

d. Which of the following is the transmission frequency is used in optical fiber communication?

- (A)  $10^9$  Hz    (B)  $10^{11}$  Hz  
(C)  $10^{14}$  Hz                                        (D) None of these

e. Function of receiver in optical Fiber is to

- (A) Reshape the degraded signal only  
(B) Amplify the degraded signal only  
(C) both amplify and reshape the degraded signal  
(D) None of these

Code: AE75 Subject: OPTOELECTRONICS AND COMMUNICATIONS

- f. Photo detector is a
- (A) Triangular device (B) square law device  
(C) linear device (D) Inverse square law device
- g. The V number of an optical fiber is 50. The number of modes in that fiber is approximately
- (A) 50 (B) 1250  
(C) 2500 (D) 4000
- h. Which of the following have the highest refractive index?
- (A) diamond (B) air  
(C) water (D) glass
- i. The responsivity of a photo diode is
- (A)  $R = \frac{P_0}{I_p}$  (B)  $R = \frac{\eta q}{h\nu}$   
(C)  $R = \frac{\eta q}{P_0}$  (D)  $R = \frac{I_p}{h\nu}$
- j. The material used for optical fiber for least losses is
- (A)  $\text{SiF}_4$  (B)  $\text{NaF}_4$   
(C)  $\text{ZrF}_4$  (D)  $\text{NaSiF}_4$

**Answer any FIVE Questions out of EIGHT Questions.**  
**Each question carries 16 marks.**

- Q.2** a. Discuss the various elements of optical fiber transmission link. (8)  
b. Discuss various fiber fabrication techniques. (8)
- Q.3** a. Derive an expression for group delay and dispersion when signal propagates along the fiber. (8)  
b. Describe the effect of mode coupling on pulse distortion. (8)
- Q.4** a. Derive an expression for optical-power generated internally to the LED. (8)  
b. Describe APD and RAPD. (8)
- Q.5** a. What do you mean by splicing of fiber? Explain various steps involved in splicing procedures. (10)  
b. Explain controlled-fracture procedure for fiber end preparation. (6)

**Code: AE75 Subject: OPTOELECTRONICS AND COMMUNICATIONS**

- Q.6** a. Explain the procedure to calculate the sensitivity of an optical receiver. (10)  
b. Draw and explain simple high-impedance preamplifier using a FET. (6)
- Q.7** a. Explain briefly  
(i) Carrier Power  
(ii) RIN (10)  
b. With neat schematic, explain basic concept of subcarrier multiplexing. (6)
- Q.8** a. How the system requirements specified related to point to point optical communication links. (8)  
b. With Block-Diagram, explain ARQ error-correction scheme. (8)
- Q.9** a. Discuss types of optical amplifiers briefly. (8)  
b. Write short notes on  
(i) Performance of Passive Linear Busses  
(ii) Architecture of four-fiber bidirectional line switched ring (BLSR) (8)