ROLL NO. _____

Code: AE75 Subject: OPTOELECTRONICS AND COMMUNICATION

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) $BW \alpha NA$ **(B)** $BW \alpha \frac{1}{NA}$

(C) $BW \alpha \frac{1}{(NA)^2}$ **(D)** $BW \alpha \frac{1}{(NA)^3}$

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

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) $R = \frac{P_0}{Ip}$ **(B)** $R = \frac{\eta q}{h_v}$

(C) $R = \frac{\eta q}{P_0}$ **(D)** $R = \frac{I_P}{h_v}$

j. The material used for optical fiber for least losses is

(A) SiF_4 **(B)** NaF_4
(C) ZrF_4 **(D)** $NaSiF_4$

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)**

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)**