Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (ECE-N)/SUPPLE/SEM-8/EC-802/2010

2010

ADVANCED COMMUNICATION SYSTEM

Time Allotted : 3 Hours | Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

$10 \times 1 = 10$

i) Modulation technique used in GSM system is

a) GMSK b) BPSK

c) QFSK d) ASK.

ii) In purely single mode operation pulse broadening is due to

a) Intermodal dispersion

b) Intramodal dispersion

c) Large bandwidth

d) None of these.

iii) Interim Standard-136 is an example of

a) 1G cellular network

b) 2G cellular network

c) 3G cellular network

d) none of these.

iv) Optical bandwidth is always

a) greater than the electrical BW

b) less than the electrical BW

c) equal to the electrical BW

d) square of the electrical BW.

v) The interface between BTS & BSC is called

a) Abis interface

b) Async interface

c) Acrew interface

d) A-B interface.

vi) The responsivity of a given PIN diode is 0·5 AW^{-1} for a wavelength of 1 micrometre. What is the output photo current when optical power of 0·2 μm at this wavelength is incident on it ?

a) 1 micrometre b) 0·1 micrometre

c) 10 micrometre d) 1 Å.

vii) Rayleigh scattering co-efficient, Γ_r depends on the wavelength λ of the light as

a) $\Gamma_r \propto \log \lambda$ b) $\Gamma_r \propto \lambda^4$

c) $\Gamma_r \propto \lambda$ d) $\Gamma_r \propto 1/\lambda^4$.

viii) Voice Activated call is a feature of

a) 1G cellular network

b) 2G cellular network

c) 3G cellular network

d) none of these.

ix) The *V* parameter for an optical fiber is 50 ; the no. of modes in that fibre is approximately

a) 50 b) 1250

c) 2500 d) 500.

x) Which of the following is the transmission frequency in optical fibre ?

a) 10^9 Hz

b) 10^{11} Hz

c) 10^{14} Hz

d) none of these.

xi) Band gap energy of a material is 1·24eV. Wavelength of peak emission is

a) 0·75 μm b) 1·0 μm

c) 1·24 μm d) 3 μm.

xii) In a GSM network, MTSO stands for

a) main terminal switching order

b) matrix terminal switching office

c) mobile terminal systems & others

d) mobile telephone switching office.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \infty 5 = 15$

2. a) Explain the concept of frequency reuse technique.

b) Enumerate different channel assignment in a cellular network. 2 + 3

3. a) What do you mean by population inversion ?

b) With the help of suitable diagram, show how population inversion is obtained during the operation of Laser diode. 2 + 3

4. Describe the process of placing a satellite into Geo-stationary orbit. 5

5. a) What are the differences between meridional rays and skew rays ?

   b) Compare between step index fibre and graded index fibre. 2 + 3

6. a) Describe the operation of Frequency Division Duplex System.

   b) What are the path losses in wireless communication ?

   3 + 2

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 ∞ 15 = 45

7. a) Explain the operation of GSM architecture with necessary diagram.

   b) What is the use of BSC in 2G-cellular network ?

   c) Explain the operation of different control channels used in GSM network ? 8 + 2 + 5

8. a) What do you mean by luminescence process ?

   b) How does an LED work ?

   c) Show the construction of ELED.

   d) What are the applications of LED ? 3 + 5 + 5 + 2

9. a) Prove that for a hexagonal geometry, the com channel reuse ratio is given by $Q = \sqrt{(3N)}$ when

$N = i^2 + ij + j^2$

b) Explain the different techniques to increase the capacity of a cellular system. 9 + 6

10. a) What are the shot noise and Johnson noise ?

b) Draw the characteristic curves for I *vs* V_R ,

P_{OPT} *vs* I_{PH} , λ *vs* R, λ *vs* absorption coefficient for photodiodes.

c) A photo detector has a load resistor of 50 ohm and the optical power absorbed by the detector is 1 micro watt. The detector has a quantum efficiency of 10% at the operating wavelength of 800 nm. Calculate the voltage across the load. 3 + 6 + 6

11. a) A glass optical fibre has a core refractive index of 1·5 and the cladding refracting index of 1·45, calculate

i) the critical angle for core — cladding interface

ii) the acceptance angle in air for the fibre

iii) NA of the fibre.

b) What do you mean by intermodel and intramodal dispersions ?

c) A multimode graded index fibre exhibits total pulse broadening of 0·1 micro sec. over distance of 15 km. Estimate

i) the maximum possible bandwidth on the link assuming low inter symbol interference

ii) the pulse dispersion per unit length

iii) the bandwidth length product for the fibre.

6 + 3 + 6

12. Write short notes on any *three* of the following : 3 ∞ 5

a) OEIC

b) Transponder and polarization hopping in satellite communication

c) Avalanche photodiode

d) Software defined radio

e) CDMA technology.