Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech/ECE/SEM-8/EC-802/2013

2013

ADVANCE 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) The cutoff wavelength GaAs material with optical energy gap of 1·4 eV at 300K is

   a) 885 nm b) 886 nm

   c) 805 nm d) 785 nm.

   ii) What is the maximum unit of BER allowed in optical communication system for faithful digital transmission ?

   a) 10^{-19} b) 10^{-9}

   c) 10^{9} d) 10^{19}.

iii) Optical bandwidth is always

a) Greater than the electrical bandwidth

b) Less than the electrical bandwidth

c) Equal to electrical bandwidth

d) Square of the electrical bandwith.

iv) In satellite communication EM wave propagates as

a) Ground wave

b) Sky wave

c) A wave propagation through ionosphere and space

d) Tropospheric wave.

v) In Ku band transponder the uplink frequency is about

a) 6 GHz b) 4 GHz

c) 18 GHz d) 14 GHz.

vi) In case of ground to ground satellite communication

a) The uplink and downlink frequencies are same and equal

b) The uplink frequency is less than the downlink frequency

c) The downlink frequency is less than the uplink frequency

d) The uplink and downlink frequencies are randomly chosen.

vii) Amplified output is given by the detector

a) p-n photodiode

b) p-i-n photodiode

c) Avalanche photodiode

d) Photovolatic diode.

viii) For long haul high speed link design, the source — fibre combination of choice should be

a) LASER single mode fibre

b) LED single mode fibre

c) LED multimode fibre

d) LASER multimode fibre.

ix) In a cordless telephone system, the base station can be connected to

a) Maximum 4 PSTN line

b) Only 2 lines

c) Depending on configuration

d) One PSTN line.

x) Bluetooth is a type of radio wave information transmission system that is good for about

a) 30 feet b) 30 years

c) 30 miles d) 300 miles.

xi) Which type of modulation technique is used in GSM ?

a) PSK b) ASK

c) MSK d) GMSK.

xii) The interface between MSC and BSC is

a) Radio interface b) Abis interface

c) A-interface d) SS7.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. a) What is V-number ?

   b) A single-mode step index fibre has a core index of 1·46 and a core diameter of 8 μm. The relative refractive index difference is 0·52%. Calculate the cut-off wavelength for the fibre.

3. Discuss the major considerations in the design of digital drive circuit for :

   a) An LED source

   b) An injection laser source

   Illustrate your answer with an example of a drive circuit for each source.

4. Draw and explain the schematic diagram of an Optical Communication system. 2 + 3

5. Draw the simplest block diagram of a Ku band satellite transponder and explain the function of each block. 2 + 3

6. Write the operating frequency of GSM for uplink and downlink channels.

   Define the following terms with their functionality :

   IMSI, IMEI, T-IMSI 2 + 3

GROUP – C

(Long Answer Type Questions)

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

7. a) What are step-index and graded-index optical fibres ? Explain why the performance of multimode grade-index fibre is improved over multimode step-index fibre ? 2 + 4

   b) A silica $\left(SiO_2\right)$ optical fibre with a core diameter large enough to be considered by ray theory analysis has a core refractive index 1·50 and a cladding refractive index of 1·47.

   Determine the following :

   i) the critical angel at the core-cladding interface

   ii) the NA for fibre

   iii) the acceptance angle in air for the fibre. 4

   c) Find out the expression for material dispersion parameter. 5

8. a) Explain the working principle of p-n junction photodiode and p-i-n photodiode. 5

   b) With derivation, prove that the optical power emitted for LED is $P = P_{in}/n(n+1)^2$. 7

   c) Discuss the direct and indirect band gap semiconductor. 3

9. a) What do you mean by CDMA ? Write down the difference between GSM and CDMA. 2 + 3

b) Draw and explain GPRS network architecture. What are GPRS radio interfaces ? 4 + 2

c) How is the location update taken place in GSM system ? 4

10. a) Write Kepler's law related to orbital period of satellite. What is the meaning of parking of satellite ? Write the difference between Geostationary and Geosynchronous satellite. What is sub satellite point ? 4

b) Derive the expression for the orbital velocity. 5

c) Why the uplink frequency is greater than the downlink frequency in Satellite Communication ? 3

d) With the help of a block diagram explain telemetry, tracking and command sub-system (TT & C) of a satellite. 3

11. Write short notes on any *three* of the following : 3 × 5

a) GPRS architecture

b) Software defined radio

c) 3G over 2G networks

d) Optical power budgeting

e) Avalanche photodiode.