Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B. TECH (ECE) /SEM-8/EC-802/2012

2012

ADVANCE COMMUNICATION ENGINEERING

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) An SIF has a core with refractive index of 1·50 and a cladding with a refractives index of 1·46. Its numerical aperture is
      a) 0·156 b) 0·244
      c) 0·344 d) 0·486.

   ii) The number of modes that can propagate along the fibre is finite because of
      a) interference in the wavefronts
      b) existence of cut-off wavelength
      c) finite group delay
      d) phase velocity is greater than velocity of light.

   iii) A satellite transponder
      a) is transmitter-receiver together
      b) converts energy
      c) is transmitter only
      d) is receiver only.

iv) Which of the following multimode fibre core sizes is not a standard commercial fibre size ?

a) 50 μm b) 5 μm

c) 76 μm d) 100 μm.

v) Modal dispersion occurs in

a) GI fibres b) Multimode fibres

c) Single mode SI fibres d) none of these.

vi) Rayleigh scattering coefficient T depends on the wavelength λ of the light as

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

c) $T \propto \lambda$ d) $T \propto \lambda^{-4}$.

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

a) PSK b) ASK

c) MSK d) GMSK.

viii) Which one of the following laws governs the movement of artificial satellites in earth orbits ?

a) Newtonian laws of mechanics

b) Law of quantum mechanics

c) Galilean laws

d) Kepler's laws.

ix) Rake receiver is used by

a) FDMA b) CDMA

c) TDMA d) SDMA.

x) GSM up-link frequency band is

a) 824 – 849 MHz b) 915 – 935 MHz

c) 895 – 915 MHz d) 935 – 960 MHz.

xi) In 2G GSM systems handoff decisions are

a) mobile assisted b) judged by channel

c) automatic d) cell independent.

xii) Frequency factor of a cellular system is given by

a) 1 / 2N b) $1 / N^2$

c) 1 / N d) 2N.

GROUP – B

(Short Answer Type Questions)

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

2. Define the terms 'acceptance angle' and 'numerical aperture' of an optical fibre. How are these related ? An optical fibre has an NA of 0·4. Find its acceptance angle. Write down the maximum value of V-number for an SMF. 2 + 1 + 1 + 1
3. Explain the difference between GSM and CDMA mobile system.
4. What is meant by handoff in the cellular system ? Explain the handoff process in mobile cellular system. 2 + 3
5. Describe placement of satellite in geo-stationary orbit.
6. Differentiate between control channels and data channels. How are channels assigned in a mobile communication system ? 2 + 3

GROUP – C

(Long Answer Type Questions)

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

7. a) Draw and explain the schematic diagram of an optical communication system ?

   b) The refractive index of the core step index fibre is 1·46 and relative refractive index difference between core and cladding of the fibre is 2%. Then find out

      i) Numerical Aperture

      ii) Acceptance angle in air

      iii) The critical angle at the core cladding interface within the fibre.

   c) What are the link time budget and rise time budget analysis ? Why is system margin provided ? 4 + 6 + 5

8. a) What are shot noise and Johnson noise ? Calculate the signal to noise ratio of a *p-i-n* photo-detector. Draw its equivalent circuit.

   b) A photo-detector has a quantum efficiency of 70% when photons with energy $2{\cdot}2 \times 10^{-19}$ joule are incident on it. Calculate

      i) the wavelength at which the photo-diode is operating

      ii) the incident power required to obtain a photo-current of 2·0 mA.

   c) Explain the temperature effect on avalanche photo-gain.

(2 + 4) + (3 + 3) + 3

9. a) Draw and explain GSM architecture.

   b) Discuss GPRS location management procedure.

   c) Explain how data transfer through GPRS network and routing occurs.

4 + 5 + 6

10. a) Write down the three laws of Kepler governing the motion of the satellites.

    b) Find out the power received in the receiving antenna from a satellite. Discuss different methods to reduce the size of the receiving antennas. Discuss satellite antenna patterns and coverage zone.

    c) Discuss the advantage of using cassegrain antenna for large earth station antenna.

4 + 7 + 4

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

    a) UMTS architecture.

    b) Role played by VLR, HLR and AUC during call setup.

    c) Noise sources in optical fibre communication

    d) Transponder and polarization hopping

    e) Forward and reverse link in CDMA based IS-95 system.