Name : .....

Roll No. : .....

Invigilator's Signature : .....

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

2010

ADVANCED 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) A step index fibre in air has a numerical aperture of 0·16, core refractive index 1·45 and core diameter 60 μm. The normalized frequency for the fibre is

   a) 60·28 b) 62·26

   c) 64·2 d) 63·42.

   ii) The number of modes that can propagate along the fibre is finite because of

   a) interference in the wave fronts/

   b) existence of cut-off wavelength

   c) finite group delay

   d) phase velocity is greater than velocity of light.

iii) 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.

iv) 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.

v) Which of the following detectors gives amplified output ?

a) P-N photodiode

b) P-I-N photodiode

c) Avalanche photodiode

d) Photovoltaic detector.

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) The scheme WDM is similar to

a) FDM for RF transmission

b) TDM

c) OFDM

d) OTDM.

viii) 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.

ix) A term relating to sending data to a satellite is

a) uplink b) downlink

c) modulate d) demodulate.

x) A laser diode has a relative spectral width of 2×10^{-3} and is emitting a mean wavelength of 1 μm. What is its spectral half-width ?

a) 1 μm b) 0·2 μm

c) 20 nm d) 2 nm.

xi) Which of the following refractive index profiles is suitable for achieving the dispersion flattened design of a single mode fibre ?

a) Matched cladding

b) Triangular profile

c) W-profile

d) Depressed cladding.

xii) Which of the following fibres is suitable for wavelength division multiplexing of signal ?

a) Dispersion optimized

b) Dispersion shifted

c) Dispersion flattened

d) Any fibre.

xiii) For hexagon geometry the number of cells per cluster is given by

a) $i^2 + i \cdot j + j^2$

b) $i^2 + i^2 \cdot j^2 + j^2$

c) $i^2 + i \cdot j + j$

d) $j^2 + i \cdot j + i$

where i and j are non-negative integers,

xiv) Frequency reuse factor of a cellular system is given by

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

c) $1/N$ d) $2N$,

where N is the cluster size.

xv) Increase in cluster size

a) increases the capacity

b) decreases the capacity

c) capacity remains same

d) none of these.

GROUP – B

(Short Answer Type Questions)

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

2. a) What do you mean by CDMA ?

   b) What is the difference between GSM and CDMA ? 2 + 3

3. What do you mean by handoff in the cellular system ? Explain the handoff process in mobile cellular system. 2 + 3

4. Write down the three laws of Kepler governing the motion of the satellites. What is the difference between the geostationary and geosynchronous orbits ? 3 + 2

5. Write short notes on PCM or AMPS.

6. Explain the roles played by VLR, HLR and AUC during call setup.

GROUP – C

(Long Answer Type Questions)

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

7. a) Explain in brief the key roles played by BSC and MSC in call setup procedure in mobile communication.

   b) Differentiate between control channels and data channels. How are channels assigned in a mobile communication system ? 8 + 2 + 5

8. a) A city having area of 1300 sq.km 7 cell reuse pattern is used to cover the region. Each cell has a radius of 4 miles and 40 MHz of spectrum with a full duplex channel BW 60 kHz is allotted to the city for cellular communication Assume GOS of 2% for an Erlang *B* system as specified. Offered traffic per user is 0·03 Erlang. Given traffic intensity per cell *A* = 84 Erlangs at a GOS of 2%. Compute

   i) the number of cells in the service area

   ii) the number of channels per cell

   iii) theoretically maximum number of user that can be served at one time by the system.

   b) Define Doppler spread, coherence bandwidth and fading margin. 3 + 3 + 3 + 2 + 2 + 2

9. a) Draw and explain GPRS Network architecture. What are GPRS radio interfaces ?

   b) Draw the GSM frame structure.

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

   d) What is 'near and far' problem in CDMA based system ? (4 + 2) + 3 + 4 + 2

10. a) The dispersion for a standard SMF is 17 ps/nm-km. To compensate the dispersion of 80 km long such fibre what would be the dispersion of DCF of length 1·5 metre ? What is the meaning of dispersion shifted fibre ?

b) Discuss the attenuation characteristics of SMF. Why is 1550 nm wavelength suitable for optical communication system ?

c) What is optical power budgeting ? Why is system margin provided ? (2 + 2) + (5 + 2) + 4

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

a) Forward and Reverse link in CDMA based IS 95 system

b) Transponder and polarization hopping

c) Software Defined Radio

d) GSM call set-up procedure

e) Noise sources in optical fibre communication.