Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(ECE-NEW/SEM-8/EC-802/2011

2011

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 × 1 = 10

i) In a paging system a page refers to

a) subscribers's no b) issued message

c) the network d) modulation scheme.

ii) The concept of "frequency reuse" is used in

a) Cellular system

b) Conventional mobile telephony

c) Paging system

d) Cordless telephony.

iii) Co-Channel interference in GSM system can be reduced by

a) Micro cells

b) Dynamic channel allocation

c) Sectoring

d) Guard band.

iv) In GPRS, an user is able to achieve a data rate of

a) 171.1 kbps b) 171.2 kbps

c) 171.3 kbps d) 171.4 kbps.

v) UMTS stands for

a) Universal mobile telecommunication system

b) Universal mobile telecommunication standard

c) Universal mobile telephone system

d) Unified mobile transfer system.

vi) If the average refractive index is n and the group refractive index is Δ then what will be the value of NA ?

a) $NA = n\ (\ 2\Delta\ )$ b) $NA = n\ (\ 2\Delta\ )^{0.5}$

c) $NA = n\sqrt{2\Delta}$ d) $NA = (\ n2\Delta\ )^{0.5}$.

vii) Amplified output is given by the detector

a) *p-n* photodiode b) *p-i-n* photodiode

c) avalanche photodiode d) photovoltaic diode.

viii) The material for making an efficient LED should be

a) a metal

b) a direct band gap semiconductor

c) an indirect band gap semiconductor

d) an insulator.

ix) Optical band width is always

a) greater than the electrical band width

b) less than the electrical band width

c) equal to the electrical band width

d) square of the electrical band width.

x) Most commercial satellite activity occurs in which band(s) ?

a) L band b) C and Ku band

c) X band d) S and P band.

xi) The satellite orbit that is highly inclined, elliptical and eccentric is the

a) Geostationary orbit b) Geosynchronous orbit

c) Molniya orbit d) Subsynchronous orbit.

xii) The geostationary satellite located at an altitude of

a) 35,786 km b) 3,578 km

c) 357,860 km d) 37,586 km.

GROUP – B

(Short Answer Type Questions)

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

2. Explain the concept of frequency reuse. What specific advantages are obtained by frequency reeuse ? How is frequency reuse actually implemented ?

3. Prove that for a hexagonal gemetry, the co-channel reuse ratio is given by $Q = \sqrt{3N}$ where, $N = i^2 + ij + j^2$.

4. Discuss the different modulation drive circuits for LEDs and explain their operation.

5. Derive Newton's law of gravitation and show that the orbit is elliptical in nature.

6. What is orbital perturbation ? How does it affect satellite communication ? What are Geosynchronous and Geostationary orbits ?

GROUP – C

(Long Answer Type Questions)

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

7. 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 ? 2 + 2

   b) Discuss the attenuation characteristics of SMF. Why 1550 nm wavelength is suitable for optical communication system ? 5 + 2

   c) What is optical power budgeting ? Why is system margin provided ? 4

8. a) Write the desired requirements of the optical source suitable for optical communication. 3

   b) Draw the structure of semiconductor LASER diode. A GaAs ILD has an optical cavity of length 250 micrometre and width 100 micrometre. At normal operating temperature the gain factor is 21×10^{-3} Acm^{-3} and the loss coefficient per cm is 10. Determine the threshold current density and hence the threshold current for the device. Given the reflectivity of the mirrors $r_1 = r_2 = 0.32$. 2 + 5

   c) Explain the operation of LED with suitable diagram. Why are direct bandgap semiconductors chosen as LED material ? 3 + 2

9. a) Write Kepler's law related to orbital period of satellite. What is the meaning of parking of satellite ? Write the difference between geosynchronous and geostationary orbit. What is sub-satellite point ? 4

b) Derive the expression for orbital velocity of a satellite. 5

c) Why is the uplink frequency greater than downlink frequency in satellite communication ? What are the advantages of cassegrain feed ? 3 + 3

10. a) What is meant by frequency reuse ? 2

b) What are the possible sources of interference which limits the performance of cellular communication systems ? On what factors does the interference depends ? 3 + 3

c) Explain the methods which is applied to reduce the interference in cellular communication system ? 4

d) Determine the distance from the nearest co-channel for a cell of radius 0.64 km and a cochannel reuse factor of 12. 3

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

a) Chromatic dispersion

b) Avalanche photodiode

c) Software defined radio

d) GSM network architecture

e) 3G over 2G wireless network.