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ENGINEERING & MANAGEMENT EXAMINATIONS, APRIL – 2009

ADVANCED COMMUNICATION SYSTEMS

SEMESTER - 8

Time : 3 Hours] [Full Marks : 70

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) A ray of light is passing from a silica glass of refractive index 1·48 to another silica of refractive index 1·46. What range of angles (measured with respect to the interface) for which this ray will undergo total internal reflection ?

a) 0° – 80° b) 81° – 90°

c) 90° – 180° d) 180° – 360°.

ii) Light is guided within the core of a step-index-fibre by

a) refraction at the core-air interface

b) total internal reflection at the core-cladding interface

c) total internal reflection at the outer surface of the cladding

d) change in the speed of light within the core.

iii) A SIF has a core with a refractive index of 1·50 and a cladding with a refracting index of 1·46. Its numerical aperture is

a) 0·156 b) 0·244

c) 0·344 d) 0·486.

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iv) Amplified output is given by the detector

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

c) avalanche photodiode d) photovoltaic diode.

v) The interface between BSC and MSC is

a) Radio air interface b) Abis interface

c) A-interface d) SS7.

vi) In the c-band transponders the uplink frequency is about

a) 4 GHz b) 6 GHz

c) 11 GHz d) 14 GHz.

vii) 'BTS' stands for

a) Base Transmission Station b) Base Transceiver Station

c) Base Transmission Station d) Base Terminal Swtch.

viii) One of the following laws governs the movement of artificial satellites in earth orbits is

a) Newtonian laws of mechanics b) Laws of quantum mechanics

c) Galilean laws d) Kepler's laws.

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

a) PSK b) ASK

c) MSK d) GMSK.

x) Most common form of modulation used in cellular communication is

a) AM b) FM

c) WBFM d) NBFM.

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xi) Modal dispersion occurs in

a) GI fibres b) Multimode fibres

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

xii) Rake receiver is used by

a) FDMA b) CDMA

c) TDMA d) SDMA.

xiii) UMTS stands for

a) Universal Mobile Telecommunication System

b) Universal Mobile Telecommunication Standard

c) Universal Mobile Telephone System

d) Unified Mobile Transfer System.

xiv) GSM up-link frequency band is

a) 824 - 849 MHz b) 915 - 935 MHz

c) 895 - 915 MHz d) 935 - 960 MHz.

xv) ERLANG is used to express

a) Noise b) Interference

c) Traffic intensity d) Signal strength.

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GROUP – B

(Short Answer Type Questions)

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

2. Define fibre acceptance angle and numerical aperture of a fibre. How are they related ? If numerical aperture of an optical fibre is 0·3, what will be its acceptance angle ? What is the maximum value of *V*-number for an SMF ? 2 + 1 + 1 + 1

3. What do you mean by drive circuit of an optical source ? Draw suitable drive circuits for analog modulation of LED. Why the LASER is more suitable in long haul optical communication ? 1 + 2 + 2

4. What are the drawbacks of APD over *p-i-n* detector ? GaAs has a band gap energy of 1·43 *eV* at 300K. Determine the wavelength above which an intrinsic photodetector fabricated from this material will cease to operate. What is dark current ? 2 + 2 + 1

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

6. What do you mean by Frequency reuse ? How is it implemented ? Explain the importance of frequency reuse in mobile communication. 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) Explain why the performance of multimode grade index fibre is improved over multimode step index fibre ?

c) The refractive index of the core of Step index fibre is 1·46 and relative refractive index difference between core and cladding of the fibre is 2% ; then estimate

i) Numerical Aperture

ii) Acceptance angle in air

iii) The critical angle at the core cladding interface within the fibre ? 4 + 5 + 6

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8. a) Discuss the direct and indirect band gap semiconductor ?

b) Explain the working principle of *p-n* junction photodiode and *p-i-n* photodiode ?

c) With derivation, prove that the optical emitted from LED is $P = P_{int} / n(n+1)^2$. 4 + 5 + 6

9. a) What is adjacent and co-channel interference ?

b) Derive an expression relating signal to noise ratio and frequency reuse ratio and therefore calculate the value of frequency reuse ratio and cluster size for US AMPS analogy FM system. Consider path loss exponent $k = 4$. 5 + 6 + 2 + 2

10. 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

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

a) Dual reflector cassegrain antenna

b) Temperature stabilzation of LASER diode

c) 3 G over 2 G wireless network

d) Optical power budgeting

e) Cordless telephone system.

END

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