

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 bandwidth.
- 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) Photovoltaic 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  $\mu\text{m}$ . 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.  $3 \times 15 = 45$

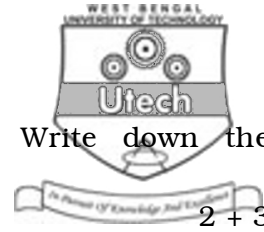
7. a) What are step-index and graded-index optical fibres ?  
Explain why the performance of multimode grade-index fibre is improved over multimode step-index fibre ?

2 + 4

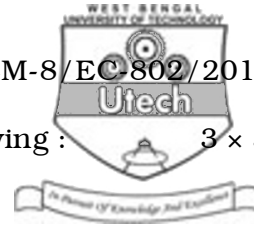
- b) A silica ( $\text{SiO}_2$ ) optical fibre with a core diameter large enough to be considered by ray theory analysis has a core refractive index 1.50 and a cladding refractive index of 1.47.

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  $P = P_{\text{in}} / n(n + 1)^2$ . 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 :  $3 \times 5$

- a) GPRS architecture
- b) Software defined radio
- c) 3G over 2G networks
- d) Optical power budgeting
- e) Avalanche photodiode.

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