Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
Manipal University

SEVENTH SEMESTER B.TECH (E & C) DEGREE END SEMESTER EXAMINATION - NOV/DEC 2016
SUBJECT: COMMUNICATION SYSTEMS (ECE - 401)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates
- Answer **ANY FIVE** full questions.
- Missing data may be suitably assumed.

1A. Starting from fundamentals, derive a suitable expression for radar range and discuss the different factors that determine the maximum range of the Radar
1B. With relevant mathematical expressions, explain butterfly effect in MTI Radar
1C. With neat diagrams, explain two types of display used in Radar systems

(5+3+2)

2A. From the fundamentals, derive the expression for electric and magnetic field components in a cylindrical waveguide
2B. With a neat block diagram, explain typical telephone set. Discuss different types of signalling tones used in conventional telephones.
2C. What are the drawbacks of conventional cordless telephones? How it is overcome in advanced cordless phones?

(5+3+2)

3A. A C-band earth station has an antenna with a transmit gain of 54 dB. The transmitter output power is set to 100 W at a frequency of 6.1 GHz. The signal is received by a satellite at a distance of 37,500 km by an antenna with a gain of 26 dB. The signal is then routed to a transponder with a noise temperature of 500 K, a bandwidth of 36 MHz, and a gain of 110 dB
   (a) Calculate the path loss at 6.1 GHz
   (b) Calculate the power at the output port of the satellite antenna, in dBW
   (c) Calculate the noise power at the transponder input, in dBW, in a bandwidth of 36 MHz
   (d) Calculate the C/N ratio, in dB, in the transponder
   (e) Calculate the carrier power, in dBW and in watts, at the transponder output
3B. With a neat block diagram, explain various subsystems of typical earth station used in geosynchronous satellite system
3C. With neat diagrams, explain i) Angle of elevation ii) Propagation delay in geostationary satellite systems

(5+3+2)

4A. With a neat block diagram, describe the architecture of GSM and discuss the interfaces in the system
4B. A cellular service provider decides to use a digital TDMA scheme which can tolerate a signal-to-interference ratio of 15 dB in the worst case. Find the optimal value of N for (a) Omni-directional antennas (Assume number of co-channel interfering cells=6), (b) 120^0 sectoring, and (c) 60°

sectoring. Should sectoring be used? If so, which case(60° or 120°) should be used? (Assume a path loss exponent of n = 4)

4C. Calculate the necessary clearance path for first Fresnel zone. Given that distance of the obstacle from transmitter = 4km and from the receiver = 3km measured along LOS. The frequency of transmission is 3GHz

(5+3+2)

5A. What is dispersion? Derive the expression for waveguide dispersion in optical fiber communication.

5B. When the mean optical power launched into an 8 km length of fiber is 120 μW, the mean optical power at the fiber output is 3 μW.

Determine: (a) the overall signal attenuation or loss in decibels through the fiber assuming there are no connectors or splices

(b) the signal attenuation per kilometer for the fiber

(c) the overall signal attenuation for a 10 km optical link using the same fiber with splices at 1 km intervals, each giving an attenuation of 1 dB

5C. A 6 km optical link consists of multimode step index fiber with a core refractive index of 1.5 and a relative refractive index difference of 1%. Estimate the delay difference between the slowest and fastest modes at the fiber output

(5+3+2)

6A. Determine the normalized frequency at 0.82μm for step index fibre having 25μm core radius n_1=1.48 & n_2=1.46. How many modes propagate in this fibre at 0.82μm? How many modes propagate at a wave length of 1.3μm? What percentage of optical power flow in the cladding in each case?

6B. With a neat diagram, explain the working of LED source which has highly directional emission pattern

6C. Explain the working of APD.

(5+3+2)