Reg. No.					



MANIPAL INSTITUTE OF TECHNOLOGY Manipal University



SEVENTH SEMESTER B.TECH (E & C) DEGREE END SEMESTER EXAMINATION NOV/DEC 2015 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. What is duplexer? Discuss working of different types of duplexers used in radar system with necessary diagrams..
- 1B. With necessary diagrams and equations, explain MTI radar with power oscillator.
- 1C. Explain working of radar beacon. Derive an expression for a beacon radar range.

(5+3+2)

- 2A. Starting from the fundamentals, derive the expression for system noise temperature of earth station receiver. A 12 GHz earth station receiving system has an antenna with a noise temperature of 50K, a LNA with a noise temperature of 100 K and a gain of 40 dB, and a mixer with a noise temperature of 1000 K. Find the system noise temperature.
- 2B. With a neat block diagram explain the communication subsystem of geostationary satellites.
- 2C. Explain the concept of Fresnel zones.

(5+3+2)

- 3A. With a neat block diagram explain the various subsystems of ground segment used in geosynchronous satellite.
- 3B. Draw the block diagram of basic telephone system. Explain different types of signalling tones.
- 3C. Discuss operation of paging system.

(5+3+2)

- 4A. How a call initiated by a mobile to Landline is established? Explain with a timing diagram.
- 4B. Consider a receiver which is located 10 km from a 50 W transmitter. The carrier frequency is 900 MHz, free

space propagation is assumed, $G_t = 1$, and $G_r = 2$, find

- (a) power at the receiver
- (b) magnitude of the E-field at the receiver antenna
- (c) rms voltage applied to the receiver input.

Assume, that the receiver antenna has a purely real impedance of 50 ohm and is matched to the receiver.

4C. If a transmitter produces 50 watts of power and it is applied to a unity gain antenna with a 900 MHz carrier frequency, find the received power in dBm at a free space distance of 100 m from the antenna. What is P_r (10 km) ? Assume unity gain for the receiver antenna.

(5+3+2)

- 5A. Draw and explain the structure of a Double hetero junction Laser Diode. Compare the output power characteristics of Laser and LED.
- 5B. Explain the following with respect to optical fibre
 - (i) V-number (ii) Micro-bending loss (iii) Splicing.
- 5C. A point source of light is 12cm below the surface of a large body of water (n=1.33). What is the radius of the largest circle on the water surface through which the light can emerge.

(5+3+2)

- 6A. Staring from fundamentals obtain the expression for magnetic & electric field components in optical wave guide.
- 6B. Given the following data, determine the pulse broadening due to material dispersion in ns/km.

Assume
$$\lambda = 850nm$$
, $\Delta \lambda = 1nm$. $\frac{d^2\beta}{d\omega^2} = 3.2 \times 10^{-26} s^2 / m$.

6C. Determine the normalized frequency at 0.82 μ m for step index fibre having 25 μ m core radius n₁=1.48 & n₂=1.46.Howmany modes propagate in this fibre at 0.82 μ m? How many modes propagate at a wave length of 1.3 μ m? What percentage of optical power flows in the cladding in each case.

(5+3+2)