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. Starting from fundamentals, derive an expression for basic radar range equation. By considering the receiver noise, modify the range equation. Discuss the system losses and propagation effects on radar performance.

1B. With necessary diagrams, explain coherent MTI radar with power amplifier.

1C. Discuss working of a wideband duplexer used in radar system

(5+3+2)

2A. A C-band geosynchronous satellite radiates a power of 1.5W with an antenna of 1.5m in diameter to an earth station having an antenna of 30m in diameter. Calculate
i) the received power
ii) the voltage level generated across a 50Ω resistor.
What is the equivalent thermal noise voltage of this resistor in a 10 kHz bandwidth?

2B. With neat diagrams explain the orbital effects in Satellite communication.

2C. Explain TTC&M subsystem of geostationary satellites with necessary diagrams.

(5+3+2)

3A. Starting from fundamentals derive an expression for electric field by considering the effect of ground reflection. Sketch the variation of electric field with respect to the distance from the transmitter.

3B. Draw the block diagram of basic cordless telephone system and explain its working. What are its limitations? How these are overcome in advanced systems? Explain.

3C. Discuss working of Paging receiver system.

(5+3+2)

4A. Draw the timing diagram of a call initiated by a landline subscriber to a mobile user with necessary steps.

4B. A cellular system with 12.5 MHz is to be operated in a city of 100 km^2 with an allowed S/I of 12 dB. If MS is moving with a maximum speed of 72 kmph is forced for handoff after 4 minutes when it crosses the cell for maximum distance. Estimate co-channel antenna spacing, P_{th} (threshold power), if the handoff processing time is 4sec. Let, P_0 = 3 dBW at 1m, n = 3, (Assume path loss, $P(r) = P_0 - 10n \log(d_i/d_0)$)

4C. A 8 miles VHF radio link operating at 200 MHz is set up between Malpe beach station and St. Mary's Island. The antenna site is on a hill top of an island with 150 ft. Calculate minimum height of the antenna at beach station, if minimum acceptable signal strength at either station is 10 μ V/m. Assume the half-wave dipole antennas are used with transmitting power as 1 Watts.

(5+3+2)

5A. Draw and explain the APD structure and its field distribution. Mention advantages of APD over PIN diode. Also mention the drawbacks of APDs.

5B. Light travelling in air, strikes a glass plate at angle of $\theta_1=33^0$, where θ_1 is measured between the incoming ray and glass surface upon striking the glass part of the beam is reflected and part is refracted. If the refracted and reflected beam makes angle of 90^0 with each other, what is the refractive index of the glass? What is the critical angle?

5C. Determine the cut-off wave length for step index fibre to exhibit single mode operation when the core refractive index is 1.46 and core radius is 4.5m with the refractive index difference of 0.25%.

(5+3+2)

6A. With neat diagrams, derive the expression for pulse broadening due to intra-modal dispersion in the optical fibre.

6B. With the neat diagram, explain the elements of an optical transmission link. Also list the advantages of optical fibre over conventional cables.

6C. An optical power of 100 W is fed in to an optical fibre of length 10km.The output power is found to be 5 watt. Calculate

(i)The overall loss in dB assuming no connector or splice losses.

(ii)The overall loss in dB/km

(iii) The overall signal attenuation for a 20km optical link using the same fibre with splice at 1km interval, each of 1dB attenuation.

(5+3+2)