ME (ETC) 1ST SEM. FINAL EXAM, 2011
MICROWAVE APPLICATIONS (ETC 934)

Time: 3 hrs. Full Marks: 70

Answer any **Five** questions

1. a) What do you mean by delay spread and coherence bandwidth? Discuss Okumara model for Outdoor propagation.

   b) Find the median path loss using Okumara model for d=50km transmitting and receiving antenna height 100m and 10m in a suburban environment. If the base station transmitter radiates an EIPR of 1 KW at a center frequency of 900MHz find the power at the receiver (assume median attenuation 43dB gain due to this environment 9dB and receiving antenna gain unity) [7+7]

2. a) Find the expression for Electric field at a receiving antenna in terms of height of the transmitting & receiving antenna and separation distance between them while considering its operation in the tropospheric region.

   b) What do you mean by Radio Horizon? Calculate the maximum range for a tropospheric transmission for which the antenna heights are 330m and 180m. [8+6]

3. a) Deduce modified Radar equation taking receiver noise into consideration.

   b) Briefly discuss about the system losses of a radar. How it can be reduced?

   c) What do you mean by RCS ? [6+6+2]

4. a) Explain the block diagram of MTI RADAR system.

   b) Write down the difference between Search Radar and Tracking Radar. Mention the factors that limit the accuracy of a radar.

   c) A search Radar has the following characteristics: Azimuth Beamwidth: 2.2degree, PRF: 630PPS, S/N for detection: 17 dB. The Radar receives a 7 dB signal to noise ratio from a 2 m^2 target at 92 nmi range. What is the maximum rotation rate of an antenna if the scan is matched to signal integration? Assume an integration loss of 2 dB. 6+4+4]

5. a) Discuss small scale fading effects in the radio channel due to multipath.

   b) Describe briefly with suitable illustration impulse response model of a multipath channel.

   c) Assume a transmitter radiates a carrier frequency of 1800 MHz. For a vehicle moving 30 m/s, compute the received carrier frequency if the mobile is moving a) Directly towards the transmitter b) Directly away from the transmitter c) In a direction which is perpendicular to the direction of arrival of the transmitted signal. [2+6+4]

6. a) Discuss briefly with suitable exhibits the various types of Antennas used in the Spacecraft.

b) An uplink operates at 14 GHz. and flux density required to saturate the transponder is -120 dB(W/m^2). The free space loss is 207 dB other propagation loss 2dB, calculate the earth station Effective Isotropic Radiated Power required for saturation.

c) What do you mean by input and output back off for satellite TWT amplifier? [6+4+4]

7. a) With suitable block diagrams describe the telemetry, tracking and command system in satellite communication.

b) Explain CDMA system with suitable illustrations.. How would you compare it with FDMA, TDMA & SDMA?

c) Why Cassegrain antenna is chosen for design of large earth stations. [6+6+2]

8. Write short notes on: (any two)

a) Active and passive repeaters

b) Frequency reuse in mobile communication

c) Synthetic Aperture Radar

d) Wireless application protocol [2x7]