



King Saud University
College of Engineering
Department of Electrical Engineering

Communication Systems
EE424
Test # 3

Time: 45 minutes

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Student Name

ID

Question I (10 marks)

1. State three types of diversity used in WM radio links.

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2. State three types of repeaters used in WM radio links.

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3. Doubling the hop distance increases antenna heights by a factor of (1 2 4 8 16)

4. Doubling the hop distance increases antenna probability of outage by a factor of (1 2 4 8 16)

5. Doubling the hop distance increases free space attenuation by: (a factor of 2 a factor of 4 3 dB 6 dB)

6. How would you define: *Noise threshold*?

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7. How would you define: *FM threshold*?

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8. Pre-emphasis network is used with MW radio systems to (reduce distortion remove ISI keep S/N constant with frequency none of these choices)

9. Analog WM radio systems use the following modulation (SSB-AM DSB-AM AM FM PCM none of these choices)

10. Digital WM radio systems use the following modulation (FSK GMSK PSK PCM none of these choices)

Question II (5 marks)

A microwave radio link operates at an RF carrier frequency of 12 GHz. The base band signal is a color TV, the hop distance is 45 km, the transmitted power is -10 dBW, and the performance objective is a signal-to-thermal noise ratio of 60 dB and reliability objective of 99.98%. Determine the following:

1. Free-space path loss
2. Receiver input noise power.
3. Fade margin
4. Minimum received signal level.
5. Antenna gain(s)

$$L (dB) = 32.4 + 20 \log (f) + 20 \log (D)$$

L: free-space attenuation, f (MHz), D (km)

$$FM (dB) = 30 \log D + 10 \log (6ABF) - 10 \log (1-R) - 70$$

FM: fade margin