Institute of Information Technology
Jahangirnagar University
Professional Masters in IT

1st Semester Final Examination, Spring 2023

Duration: 3 Hours

Intake: Spring 2023, Fall 2022

Full Marks: 60

Course Code: PMIT – 6217

Course Title: Wireless Network

Do not write anything on the question paper.
There are **7 (Seven)** questions. Answer any **5 (Five)** of them.
Figures in the right margin indicate marks.
[Follow the question order]

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1. a) Explain briefly the propagation of Radio waves through space — 3
    b) Mention some commonly used devices for wireless networking. Describe two of them. — 3
    c) Explain at least 3 limitations of Wireless Networks. Show 6 scenarios which present a specific challenge or problem that comes up when working with wireless equipment. — 3
    d) Explain about IEEE 802.15.4 standard — 3

2. a) "Wireless LANs can operate in one of two configurations, with a base station and without a base station". Explain this statement. — 3
    b) Explain Infrared LANs mentioning some advantages and disadvantages — 3
    c) "Dynamic selection of the physical-layer modulation technique can be used to adapt the modulation technique to channel conditions." Explain — 3
    d) Explain the Destination-Sequenced Distance Vector (DSDV) Packet Process Algorithm with example. "DSDV is suitable for small networks" Why? — 3

3. a) Explain Sensor Node Structure — 4
    b) The Low-Energy Adaptive Clustering Hierarchy (LEACH) is an application-specific protocol architecture that aims to prolong network lifetime by periodic re-clustering and change of the network topology. Now explain this Clustering Protocol — 4
    c) To reduce the packet dropping probability or to enhance throughput of wireless LAN exponential binary backoff algorithm is widely used. The access method of MAC protocol of IEEE 802.11 based on exponential binary backoff algorithm can be explained with some steps. Explain those steps. — 4

4. a) "FDMA wastes bandwidth", How? Explain. Do you agree "TDMA is a complimentary access technique to FDMA"? If you agree then show your logic. — 4
    b) Define Cell Capacity of a TDMA System. Now calculate the capacity and spectral efficiency of a TDMA system using the following parameters: bandwidth efficiency factor $\eta_b = 0.9$, bit efficiency (with QPSK) $\mu = 2$, voice activity factor $v_f = 1.0$, one-way system bandwidth $B_w = 12.5$ MHz, information bit rate $R = 16.2$ kbps, and frequency reuse factor $N = 19$. — 4

c) State some gains of Spread Spectrum Multiple Access technique. Whether CDMA Direct Sequence Spread Spectrum system or not? Explain

5. a) Define PN Sequences. Draw a 16-bit Fibonacci linear-feedback shift register. If the seed is 1010110011100110. Find the PN sequences for four rounds.   4

   b) Define Quadrature amplitude modulation (QAM). How many bits are represented by each symbol in 64-QAM? Sketch a constellation diagram for 64-QAM.   4

   c) Explain Gaussian frequency-shift keying   4

6. a) Explain OFDM Versus FDM. How do OFDM Subcarriers Work?   6

   b) Draw a baseband OFDM transmission model. Proof the statement "When integrating received power over one symbol period, T_U, the output of the correlators is zero for any combination, except when $k = q$"   6

7. a) Define Cell Clusters. What do you mean by frequency reuse pattern. Explain the relationship between D and R from the equation: $D = \sqrt{3N}R$ 6

   b) Calculate the signal to interference ratio (S/I) from the worst-case scenario for co-channel interference if cluster sizes are N=7 and N=12.
   If we assume the reuse distance D is same for six interfering cells then S/I=? for the same sizes   6