COGNITIVE RADIOS & NETWORKS
(ECEN 5241)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

    (i)   An ANN represents
            (a) a set of non linear functions   (b) a set of artificial nerves
            (c) a set of application softwares   (d) none of these.

    (ii)   The basic premises of Artificial Intelligence in Cognitive Radio are
            (a) awareness, reasoning, and learning
            (b) sensing and applying
            (c) debugging and reprogramming
            (d) monitoring and reorganizing.

    (iii)   Spectrum mobility
            (a) uses specific frequency
            (b) changes its frequency of operation
            (c) sharing different frequencies
            (d) none of the above.

    (iv)   Which of the following process can be done by CR?
            (a) Spectrum Mobility   (b) Spectrum Management
            (c) Spectrum Sharing   (d) All the above.

    (v)   What is the wireless communications technology used in retail operations to identify and secure merchandise?
            (a) ISM   (b) RFID
            (c) UNII   (d) Micro Sensors.

(vi) Cyclostationary feature detection is
(a) centralized
(b) distributed
(c) cooperative
(d) non cooperative.

(vii) The waveform signal processing represents ------- % computational load
(a) 90%
(b) 80%
(c) 70%
(d) 60 %.

(viii) Gray Space spectral occupancy signifies
(a) partial interferes
(b) full interferes
(c) small interferes
(d) negligible interferes.

(ix) Matched filtering is basically
(a) Modulation Technique
(b) Multiplexing Technique
(c) Demodulation Technique
(d) Demultiplexing Technique.

(x) Distributive Cognitive Radio network means
(a) fusion centre based network
(b) infrastructure based network
(c) local Sensing based network
(d) data network.

Group - B

2. (a) What do you understand by the word "Trade off in Cognitive Radio?" Discuss the "Antenna Trade off" scheme.

(b) What do you understand by the term "Plug and Play" module? Explain the interface topology among plug and play modules.

(2 + 4) + (2 + 4) = 12

3. (a) Explain the features of Aware and Adaptive Radio.

(b) What is the necessity for framing an International Standard for implementation of CR functionalities? Write a note on IEEE 802.22 standards applicable for all CR activities.

4 + (3 + 5) = 12

Group - C

4. (a) Explain the concept of Radio Flexibility and capability in Cognitive Radio.

(b) What are the tradeoffs required in SDR? Define the term "Data Explosion"?

6 + (3 + 3) = 12

5. (a) What is the software defined by the Object Management group enabling the use of a variety of computer languages? Explain the process for SCA compliance and testing.

(b) Explain the concept of Radio Flexibility and capability in Cognitive Radio.

(2 + 4) + 6 = 12

Group - D

6. (a) Define Cognitive Radio? What is the importance of Cognitive Radio technology? What are the key applications of Cognitive Radio

(b) What are the security aspects of Cognitive Radio Network? Explain Briefly.

(2 + 2 + 2) + 6 = 12

7. (a) Classify cognitive radio users based on spectrum utilization. Why underlay network implementation is more challenging than interweave network? Explain.

(b) What are the three main functions for dynamic spectrum access? Explain.

(3 + 4) + 5 = 12

Group - E

8. (a) What do you mean by localization in Cognitive Radio network? Why location awareness is an essential feature in Cognitive Radio network?

(b) Explain Weighted Centroid Localization algorithm. How accuracy of WCL algorithm can be enhanced?

(1 + 3) + (5 + 3) = 12

9. (a) What are the upper layer issues in Cognitive Radio Networks?

(b) Define energy based detection technique. Why system threshold selection is one of critical factor in energy based sensing method?

6 + (2 + 4) = 12