

**COGNITIVE RADIOS AND 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 any 5 (five) from Group B to E, taking at least one 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) Learning about the environment is a key feature of
    - (a) Aware Radio
    - (b) SDR
    - (c) Software capable Radio
    - (d) None of these.
  - (ii) QoS requirement for secondary users are related to:
    - (a) Data Rate
    - (b) Acceptable error Rate
    - (c) Latency
    - (d) All of these.
  - (iii) Cognitive Radios can:
    - (a) change its transmitter parameters
    - (b) detect user communication need
    - (c) choose appropriate wireless services
    - (d) all of these
  - (iv) Power PC is a class of
    - (a) GPP
    - (b) FPGA
    - (c) Multimedia Processor
    - (d) None of these.
  - (v) An advantage of SDR is that,
    - (a) it can transmit and receive various modulation methods
    - (b) it does not need any interfacing
    - (c) good dynamic range
    - (d) none of these.
  - (vi) Matched filtering is basically a:
    - (a) Modulation Technique
    - (b) Multiplexing Technique
    - (c) Demodulation Technique
    - (d) Demultiplexing Technique.
  - (vii) Primary emulation attack affects
    - (a) Secondary Users
    - (b) Primary Users
    - (c) Fusion Centres
    - (d) Cellular Networks.

- (viii) Underlay Cognitive Users use spectrum of:  
(a) White Spaces (b) Black Spaces  
(c) Gray Spaces (d) Reliable Spa.
- (ix) Spectral Estimation Method include  
(a) Multiplier Method (b) Multitaper Method  
(c) Maxima Method (d) Single Estimation Method.
- (x) Localization of a primary user means  
(a) Locate the exact coordinate (b) Locate the channel frequency  
(c) Locate the interference level (d) None of these.

### Group - B

2. (a) Highlight the major Advantages and disadvantages of a Software Defined Radio  
(b) What is an Adaptive Radio? Mention its features.  
 $5 + (4 + 3) = 12$
3. (a) In technology Trade Off, explain how it is done in Antennas?  
(b) What are plug and play Modules? What benefits are achieved through this?  
 $6 + (2 + 4) = 12$

### Group - C

4. (a) What are the functions of CORBA? Explain with a diagram the architecture.  
(b) Draw the Block schematic diagram of a SDR and label the units.  
 $(2 + 5) + 5 = 12$
5. (a) Elaborate the concept of "Radio Flexibility and capability" of Cognitive Radio.  
(b) Explain, how, Artificial Intelligence techniques are applied in Cognitive Radio.  
 $6 + 6 = 12$

### Group - D

6. (a) What is the difference between spectrum mobility and spectrum handoff? Briefly explain the importance of spectrum mobility in cognitive radio network design?  
(b) How hidden and exposed terminal problem can be minimized in cognitive radio network?  
 $(4 + 2) + (3 + 3) = 12$
7. (a) Define cognitive radio? What is the importance of dynamic spectrum sensing in cognitive radio network? Write the key applications of cognitive radio technology in communication system.

- (b) Briefly explain the deployment procedure of underlay cognitive radio network. Why underlay network implementation is more challenging than inter-wave network? Explain

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

### **Group - E**

8. (a) Derive test static of energy detector for analog signal. What are the critical factors associated with the energy detector and why?

- (b) What are the differences between centralized and distributed localization? How mobility effect the localization process?

**(3 + 3) + (2 + 4) = 12**

9. (a) What are the different class of security aspect in the cognitive radio network? Briefly explain security issues associated with underlay cognitive radio user.

- (b) What are the upper layer issues in Cognitive Radio Networks?

**(4 + 4) + 4 = 12**

<b>Department &amp; Section</b>	<b>Submission Link</b>
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