

M.TECH/ECE/3RD SEM/ECEN 6141/2017
COGNITIVE RADIO TECHNOLOGY
(ECEN 6141)

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) Radio Spectrum scarcity is largely due to
(a) physical shortage of spectrum (b) inefficient allocation
(c) lack of flexibility (d) a mixture of all of these.
- (ii) Primary network in Cognitive Radio has access to
(a) TV broadcast network (b) Cellular network
(c) WLAN (d) both (a) & (b).
- (iii) Middleware layer CORBA provides
(a) authentication (b) segregation
(c) field programming (d) none of these.
- (iv) Aware Radio is one that
(a) uses small number of frequencies
(b) can sense all or part of environment
(c) is adaptive
(d) uses fixed modulation schemes.
- (v) IEEE 802.22 WRAN standard specifications include
(a) GPS based support (b) system with BS and CPE
(c) distributed sensing capability (d) all of these.

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- (vi) "Plug and play" in SDR signifies
(a) Industry wide component reuse (b) CORBA applications
(c) predictability (d) both (a) & (c).
- (vii) Gray Space spectral occupancy signifies
(a) partial interferes (b) full interferes
(c) small interferes (d) negligible interferes.
- (viii) Primary emulation attack affects
(a) Cognitive Users (b) Primary Users
(c) Fusion Centres (d) Cellular Networks.
- (ix) Hyken's proposed Cognitive Cycle completed in
(a) three steps (b) four steps
(c) six steps (d) seven steps.
- (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 are the 3 distinct processor hardware of SDR? What are their specifications in terms of MIPS?
(b) In a typical hardware architecture of SDR, highlight the features of RFFE and Modem.

(3 + 3) + (3 + 3) = 12

3. (a) What do you understand by the word "Trade off in Cognitive Radio?" Discuss the "Antenna Trade off" scheme.
(b) What are the 5 spectrum sharing steps in SDR?

(2 + 5) + 5 = 12

Group - C

4. (a) Draw a chart highlighting radio properties of S/W capable radio, S/W programmable radio, SDR, Aware, Adaptive and CR.

- (b) What is an Artificial Neural Network and how is it used in CE?

6 + 6 = 12

5. (a) Draw the Software Communication Architecture of SDR and explain the function of MMP.

- (b) Highlight the salient specifications of IEEE 802.22 WRAN standard as applied to cognitive radios.

6 + 6 = 12

Group - D

6. (a) Explain with proper block diagram RF front-end architecture of Cognitive Radio Network over Software Defined Radio.

- (b) What are the security aspects of Cognitive Radio?

8 + 4 = 12

7. (a) Define spectrum efficiency under Cognitive Radio. How is spectrum efficiency dependent on the various aspects of CR?

- (b) Explain spectrum handoff.

- (c) What do you mean by Denial of Service and Primary User Emulation Attack?

(2 + 3) + 3 + 4 = 12

Group - E

8. (a) Define spectrum efficiency under Cognitive Radio. How is spectrum efficiency dependent on the various aspects of CR?

- (b) Why threshold optimization is important in energy based sensing method?

(2 + 5) + 5 = 12

9. (a) What do you mean by spectrum mobility and sharing?

- (b) What do you mean by localization in Cognitive Radio Network? Why location awareness is an essential feature in Cognitive Radio Network?

- (c) Briefly explain matched filtering technique.

2 + (2 + 3) + 5 = 12