

M.TECH/ECE/3RD SEM /ECEN 6141/2015
2015

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 alternatives for the following: 10 x 1=10
- (i) Indicate the hardware component not included in the Digital back End of Software Defined Radio (SDR)
(a) FPGA (b) LNA (c) DSP (d) GGP.
- (ii) Software portability to different hardware platforms is effected through
(a) API (b) DDC (c) DUC (d) MMI.
- (iii) In SDR, different hardware components can be arranged to form different structures. This feature is termed as
(a) portability (b) reconfigurability (c) adaptability (d) transferability.
- (iv) CORBA in Software Communication Architecture (SCA) is a
(a) Software (b) hardware (c) firmware (d) None of these.
- (v) GNU Radio operates with programming language is known as
(a) FORTRAN (b) COBOT (c) JAVA (d) PYTHON.
- (vi) In analog energy detector, first stage is
(a) Bandpass Fiiter (b) Bandlimit Filter
(c) Bandreject filter (d) Lowpass Filter.
- (vii) Spectrum Hole in Cognitive Radio Network signifies
(a) Underutilized Radio Spectrum (b) White Space of Radio Spectrum
(c) Partially Used Radio Spectrum (d) Over Utilized Radio Spectrum.
- (viii) Denial of service is applicable for
(a) Cooperative Sensing Technique (b) Non Cooperative Sensing Technique
(c) Cognitive Security Issues (d) Licensed User Security issue.
- (ix) Mitola's proposed Cognitive Cycle Contains
(a) Three Steps (b) Four Steps (c) Six Steps (d) Seven Steps.

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- (x) What is the range of white space in TV Broadcasting Band?
(a) 84-850 MHz (b) 80-854 MHz (c) 52-854 MHz (d) 54-852 MHz.

Group - B

2.(a) Give a short account of CORBA centric software structure of Communication Software Architecture (SCA) embedded in SDR.

(b) What are the different signal processors used in the digital back end of SDR transceivers? Enumerate the specification and give a brief sketch of functionality of two of the processors.

6 + 6 = 12

3.(a) Mention the different hardware components and software modules needed for design of SDR transceiver. Describe briefly their functions.

(b) Why is digital baseband signal processing is a major task in SDR compared to RF front end operations?

8 + 4 = 12

Group - C

4.(a) Describe the specifications and functionality of the following processors in SDR-
(i) General Purpose Processor (ii) Digital Signal Processor (iii) FPGA.

(b) What is the function of a MODEM and how is it implemented?

9 + 3 = 12

5.(a) Write a note on IEEE 802.22 standards for implementation of CR functionalities.

(b) Highlight the essential features in the application of Cognitive Radio in the following Wireless communication networks: (i) Cellular Mobile Networks (ii) Wireless Networks for Smart Grid

6 + (3 + 3) = 12

Group - D

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

(b) Describe the design rules in detail for Cognitive Radio.

4 + 8 = 12

- 7.(a) What is the protocol stack of Software Defined Radio?
(b) With a neat diagram, explain the simplified cognition cycle.
(c) What are the major security issues in Cognitive Radio Network?

$2 + 4 + 6 = 12$

Group - E

- 8.(a) What do you mean by spectrum sensing and detection?
(b) Why non-cooperative spectrum sensing is more suitable than cooperative sensing?
(c) What are the application areas of matched filter detection?
(d) What is the significance in reduction in transmission power in Cognitive Radio Network?

$2 + 3 + 2 + 5 = 12$

- 9.(a) Why cyclostationary based sensing is more reliable than energy based detection?
(b) Differentiate centralized and distributed inter-network spectrum sharing.
(c) What are the upper layer issues in Cognitive Radio Networks?
(d) What are the cross layer challenges in upper layers?

$4 + 2 + 3 + 3 = 12$