JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2024

M.Tech-I Semester (ECE)

COURSE CODE (CREDITS): 21M1WEC137 MAX. MARKS: 35

COURSE NAME: Advanced Cognitive Radio

COURSE INSTRUCTORS: Dr. Shweta Pandit MAX. TIME: 2 Hours

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q.No	Question	CO	Marks
Q1	a) Assess the impact of user demands on the evolution of software defined radio (SDR) and cognitive radio (CR) technologies. b) A reconfigurable digital radio uses an OFDM waveform with 64 subcarriers and a subcarrier spacing of 15 kHz. Calculate the total bandwidth.	1	2 1
Q2	Develop a block diagram of a realistic SDR architecture for WiMAX networks, incorporating reconfigurable components.	3	5
Q3	a) Describe how a software tunable impedance synthesizer optimizes radio performance. b) Analyze the challenges of implementing sensing and awareness functionalities in SDR-based cognitive radios. Devise a method for evaluating the accuracy of spectrum sensing in cognitive radios.	2	2 3
Q4	Describe the difference between spatial multiplexing and space-time coding in MIMO systems. For a MIMO system with 4 transmit antennas and 2 receive antennas, calculate the total number of spatial streams. Also analyze the role of antenna spacing in reducing interference in MIMO-based SDR systems.	2	4
Q5	a) Analyze the trade-offs between linear and nonlinear power amplifiers in SDR systems. b) In a pulse shaping filter, the roll-off factor is 0.25 and the symbol rate is 1 MSym/s. Calculate the bandwidth of the filter.	4	2 2
Q6	Differentiate between the architectures of ASIC, DSP, FPGA, GPPs and hybrid DSP/FPGA platforms.	4	3
Q7	Analyze the effect of ADC resolution and sampling rate on the overall performance of CR. Suppose a CR system employs a receiver with an ADC resolution of 12 bits. What is the total number of discrete levels in the ADC?	4	3
Q8	Create a model for integrating multiple antenna systems with SDR for future 6G applications.	3	4
Q9	Compare NOMA with traditional Orthogonal Multiple Access (OMA) techniques in terms of throughput, fairness, and spectral efficiency in CRNs	3	4