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BEC703

**Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026**  
**Wireless Communication Systems**

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.*  
*2. M : Marks , L: Bloom's level , C: Course outcomes.*

| Module – 1 |    |                                                                                                                                                                                  | M  | L  | C    |
|------------|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|------|
| Q.1        | a. | Derive an Expression for Rayleigh Fading Wireless Channel.                                                                                                                       | 10 | L2 | CO2. |
|            | b. | In the wireless Rayleigh fading channel consider a transmit power $P_t$ (dB) = 20 dB. What is the probability that the power at the receiver is greater than $P_r$ (dB) = 10 dB? | 10 | L2 | CO1  |
| OR         |    |                                                                                                                                                                                  |    |    |      |
| Q.2        | a. | Explain the modeling of wireless systems with proper equations.                                                                                                                  | 10 | L2 | CO1  |
|            | b. | Give the mathematical equations for RMS Delay Based on Average Power Profile.                                                                                                    | 10 | L2 | CO1  |
| Module – 2 |    |                                                                                                                                                                                  |    |    |      |
| Q.3        | a. | Explain the Properties of PN sequences.                                                                                                                                          | 10 | L2 | CO1  |
|            | b. | Explain any two advantages of CDMA.                                                                                                                                              | 10 | L2 | CO1  |
| OR         |    |                                                                                                                                                                                  |    |    |      |
| Q.4        | a. | Illustrate OFDM with an example.                                                                                                                                                 | 10 | L2 | CO1  |
|            | b. | With neat schematic explain MIMO-OFDM Transmitter.                                                                                                                               | 10 | L2 | CO1  |
| Module – 3 |    |                                                                                                                                                                                  |    |    |      |
| Q.5        | a. | Explain GSM Network Architecture.                                                                                                                                                | 10 | L2 | CO1  |
|            | b. | Explain IP-Based Flat Network Architecture.                                                                                                                                      | 10 | L2 | CO1  |
| OR         |    |                                                                                                                                                                                  |    |    |      |
| Q.6        | a. | Explain Multi Antenna techniques.                                                                                                                                                | 10 | L2 | CO1  |
|            | b. | Explain LTE Network Architecture with necessary diagram.                                                                                                                         | 10 | L2 | CO1  |
| Module – 4 |    |                                                                                                                                                                                  |    |    |      |
| Q.7        | a. | Explain MIMO System Model.                                                                                                                                                       | 10 | L2 | CO1  |
|            | b. | Derive Expression for MIMO Zero-Forcing (ZF) Receiver.                                                                                                                           | 10 | L2 | CO1  |

OR

|                   |    |                                                                                                                                      |    |    |     |
|-------------------|----|--------------------------------------------------------------------------------------------------------------------------------------|----|----|-----|
| Q.8               | a. | Compute the MIMO zero-forcing receiver for the channel matrix H given<br>$H = \begin{bmatrix} 2 & 3 \\ 1 & 3 \\ 1 & 2 \end{bmatrix}$ | 10 | L3 | CO2 |
|                   | b. | Derive expression for MIMO MMSE Receiver.                                                                                            | 10 | L2 | CO1 |
| <b>Module – 5</b> |    |                                                                                                                                      |    |    |     |
| Q.9               | a. | With neat diagram, explain design principles of LTE Network.                                                                         | 10 | L2 | CO1 |
|                   | b. | Explain the Hierarchical Channel Structure of LTE.                                                                                   | 10 | L2 | CO1 |
| <b>OR</b>         |    |                                                                                                                                      |    |    |     |
| Q.10              | a. | Explain the time domain frame structures of OFDM.                                                                                    | 10 | L2 | CO1 |
|                   | b. | Explain Uplink SC-FDMA Radio Resources.                                                                                              | 10 | L2 | CO1 |

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