Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Code : 17EC3025** |  | **Duration :** | **3hrs** |
| **Sub. Name : SMART ANTENNAS** |  | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Demonstrate the effect of separation angle between two sources using an 8-element linear array with a separation of λ/2. | CO1 | 08 |
| b. | Explain the concept of degrees of freedom with suitable example. | CO1 | 12 |
| **(OR)** | | | | |
| . | a. | With a neat block diagram of an antenna array system, explain the elements of smart antenna systems. | CO1 | 15 |
| b. | Illustrate the implementation of digital radio receiver with different array geometries of smart antennas. | CO1 | 05 |
|  |  |  |  |  |
| 3. |  | Compare constrained and unconstrained optimal beam former and obtain the expression for signal to noise ratio. | CO3 | 20 |
| **(OR)** | | | | |
| 4. | a. | Explain in detail the broad band processing. | CO3 | 10 |
| b | Elucidate digital radio receiver techniques and software radio for smart antenna. | CO3 | 10 |
|  |  |  |  |  |
| 5. | a. | Differentiate between constrained and unconstrained LMS algorithm and illustrate the calculation of excess mean square error in unconstrained LMS algorithm. | CO2 | 10 |
| b. | Draw the real and complex beam former structures and list out the implementation issues of a real time beam forming system. | CO2 | 10 |
| **(OR)** | | | | |
| 6. | a. | Explain in detail the importance of adaptive beam space processing with an example. | CO2 | 10 |
| b. | Discuss in detail the Neural network approach adaptive processing. | CO2 | 10 |
|  |  |  |  |  |
| 7. | a. | Explain in detail the different MUSIC algorithms of DOA estimation. | CO5 | 10 |
| b. | Describe how the direction of signal arrival from the source is estimated by maximum entropy method. | CO5 | 10 |
| **(OR)** | | | | |
| 8. | a. | Discuss about how the signal parameters estimation via ESPRIT is a computationally efficient method of DOA estimation. | CO5 | 10 |
| b. | What is Angle of Arrival estimation? Write its significance in communications systems. Discuss briefly about AOA methods. | CO5 | 10 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Examine the performance of an optimal combiner when there are more co-channel interferences than the number of elements in the array in fading conditions. | CO4 | 10 |
| b. | Discuss how maximal ratio combiner works in Nakagami fading environment and Rayleigh fading environment. | CO4 | 10 |