**20EC701**

**Hall Ticket Number:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IV/IV B.Tech (Regular) DEGREE EXAMINATION** | | | | |
| **December, 2023** | | **Electronics & Communication Engineering** | | |
| **Seventh Semester** | **Radar Engineering** | | | |
| **Time:** Three Hours | | | **Maximum:** 70 Marks | |
| ***Answer question 1 compulsory.*** | | | | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | | | | **(4X14=56 Marks)** |
|  | | | |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | CO | BL | M |
| 1 | a) | Specify X-Band normal frequency Range for Radar | CO1 | L2 | 1M |
|  | b) | Define PRF. | CO1 | L3 | 1M |
|  | c) | What is A-scope display in radar. | CO1 | L3 | 1M |
|  | d) | What is the simple form of a radar range equation? | CO1 | L3 | 1M |
|  | e) | What is the relationship between Doppler frequency and relative velocity of a radar system? | CO2 | L3 | 1M |
|  | f) | Write the applications of CW radar. | CO2 | L2 | 1M |
|  | g) | Why CW radar is unable to measure radar range? | CO2 | L2 | 1M |
|  | h) | Why staggered PRF is used for non-stationary targets? | CO2 | L2 | 1M |
|  | i) | What are various types in tracking mechanism? | CO3 | L3 | 1M |
|  | j) | What is Plan Position Indicator(PPI) | CO3 | L3 | 1M |
|  | k) | Define Noise Temperature in radar receiver. | CO3 | L3 | 1M |
|  | l) | List out different types of electronic warfare | CO4 | L2 | 1M |
|  | m) | What is ECM Jamming | CO4 | L3 | 1M |
|  | n) | What is 3-Dimensional Radar? | CO4 | L3 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | Derive the Radar range equation in terms of signal to noise ratio and integration efficiency | CO1 | L3 | 7M |
|  | b) | Calculate maximum range of a Radar which operates at a frequency of 10 GHz, peak transmitting power at 500 KW. Antenna effective area is 4.5m2 , Radar cross section of target is 30m2  and minimum received power is 0.25 picowatts. | CO1 | L2 | 7M |
| **(OR)** | | | | | |
| 3 | a) | Explain various Factors and Problems affecting the performance of Radar System. | CO1 | L3 | 7M |
|  | b) | A radar operating at 4 GHz radiating a power of 600 KW. Calculate the power of the reflected signal at the radar with a 30 m2 target at 500 KM. Assume antenna aperture area is 10 m2 . | CO1 | L2 | 7M |
| **Unit-II** | | | | | |
| 4 | a) | Draw the block diagram and explain working of CW radar for measuring Doppler shift | CO2 | L3 | 7M |
|  | b) | Distinguish between MTI and Pulse Doppler Radar | CO2 | L4 | 7M |
| **(OR)** | | | | | |
| 5 | a) | Explain working of MTI radar with neat block diagram. | CO2 | L3 | 7M |
|  | b) | A MTI Radar operates at frequency of 8GHz with a PRF of 300 PPS. Calculate the first three blind speeds of this Radar. | CO2 | L2 | 7M |
| **Unit-III** | | | | | |
| 6 | a) | With a neat diagram explain the operation of a conical scan tracking Radar. | CO3 | L3 | 7M |
|  | b) | Explain the working of monopulse tracking Radar. | CO3 | L2 | 7M |
| **(OR)** | | | | | |
| 7 | a) | Explain the working of mixers in radar receiver. | CO3 | L3 | 7M |
|  | b) | Write short notes on:   1. Branch type duplexer (ii) Balanced duplexer | CO3 | L1 | 7M |
| **Unit-IV** | | | | | |
| 8 | a) | Explain different types of Electronic counter measures in Radar | CO4 | L3 | 7M |
|  | b) | Compare ECM and ECCM. | CO4 | L1 | 7M |
| **(OR)** | | | | | |
| 9 | a) | Explain Stealth applications of Radar | CO4 | L2 | 7M |
|  | b) | Write short notes on the following  HF Over-the-Horizon Radar ii) Air-Surveillance Radar. | CO4 | L1 | 7M |

