**18EC701**

**Hall Ticket Number:**

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| **IV/IV B.Tech (Regular) DEGREE EXAMINATION** | | | |
| **December, 2021** | **Electronics and Communication Engineering** | | |
| **Seventh Semester** | **Microwave and Radar Engineering** | | |
| **Time:** Three Hours | | **Maximum:** 50 Marks | |
| *Answer Question No.1 compulsorily.* | | | (10X1 = 10 Marks) |
| *Answer ONE question from each unit.* | | | (4X10=40 Marks) |

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| 1. | a) | Why conventional tubes cannot generate microwave power? | CO1 | 1M |
|  | b) | Name and draw some type of slow wave structures? | CO1 | 1M |
|  | c) | Write the conditions for any device that exhibit negative resistance in their V-I characteristics? | CO1 | 1M |
|  | d) | Define coupling coefficient and directivity of coupler? | CO2 | 1M |
|  | e) | What is frequency pulling and frequency pushing in cavity Magnetrons? | CO2 | 1M |
|  | f) | What are the operating frequencies of TRAPATT device? | CO2 | 1M |
|  | g) | What the relation between Pulse Repetition period and Pulse Repetition frequency in a Radar System? | CO2 | 1M |
|  | h) | Compare and contrast the situations with a power amplifier and a power oscillator in the transmitter of an MTI system? | CO3 | 1M |
|  | i) | Describe the Doppler Effect. | CO3 | 1M |
|  | j) | Define Noise Temperature and give its relationship with Noise figure. | CO3 | 1M |
| **Unit -I** | | | | |
| 2. | a) | Explain the principle of operation of two-cavity klystron amplifier and derive an expression for the optimum length? | CO1 | 5M |
|  | b) | An IMPATT diode has a drift length of 2μm. Determine the drift time of the carriers and the operating frequency of the diode? | CO1 | 5M |
| **(OR)** | | | | |
| 3. | a) | Discuss the techniques for the enhancement of overall efficiency of TWT? | CO1 | 5M |
|  | b) | A reflex klystron operates at the peak mode of n=2 with beam voltage Vo= 3000, beam current Io= 20 mA and signal voltage Vi=40V determine the output power and efficiency? | CO1 | 5M |
| **Unit -II** | | | | |
| 4. | a) | Explain how high VSWR can be measured by double minimum method? | CO2 | 5M |
|  | b) | Obtain the scattering matrix for a 3-port circulator and also prove that it is impossible to construct perfectly matched lossless reciprocal three port junction? | CO2 | 5M |
| **(OR)** | | | | |
| 5. | a) | With a suitable diagram explain the operation of ferrite isolator? | CO2 | 5M |
|  | b) | The calibrated power from a generator as read at the power meter is 25 mw. When a 3 dB attenuator with VSWR of 1.3/1 is inserted between the generator and the detector, what value should the power meter read? | CO2 | 5M |
| **Unit -III** | | | | |
| 6. | a) | Derive the simple radar range equation in terms of minimum detectable signal to noise ratio (S/N)min and explain why (S/N) min is a better measure of a radar detection than the minimum detectable signal (Smin). | CO3 | 5M |
|  | b) | Explain how the noise signals are limiting the performance of FMCW altimeter. | CO3 | 5M |
| **(OR)** | | | | |
| 7. | a) | Explain the principle of operation of CW Doppler radar with non zero IF receiver. | CO3 | 5M |
|  | b) | What is Maximum Unambiguous Range? How is it related with pulse repetition rate? | CO3 | 5M |
| **Unit -IV** | | | | |
| 8. | a) | Find What are Delay line cancellers and explain their filter characteristics? | CO4 | 5M |
|  | b) | A MTI Radar operates at frequency of 6GHz with a PRF of 800 PPS. Calculate the lowest blind speeds of this Radar. | CO4 | 5M |
| **(OR)** | | | | |
| 9. | a) | Draw the block diagram of MTI radar using range gates and filters and explain each block. | CO4 | 5M |
|  | b) | Write short notes on the operation of an MTI radar system with a power amplifier as the transmitter. | CO4 | 5M |

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