**SRM Institute of Science and Technology**

**Batch-II**

**SET-B**

**College of Engineering and Technology**

**DEPARTMENT OF ECE**

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamil Nadu

**Academic Year: 2022-23 (Even)**

**Test: CLAT-2** **Date: 04-04-2023**

**Course Code & Title: 18ECC302J–Microwave and Optical Communication** **Duration: 12.30PM–02.10PM**

**Year & Sem:** **III / VI** **Max. Marks:** **50**

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|  | **18ECC302J - Microwave & Optical Communications** | **Program Outcomes (POs)** | | | | | | | | | | | | | | |
| **Graduate Attributes** | | | | | | | | | | | | **PSO** | | |
| **S. No.** | **Course Outcomes (COs)** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** |
| 1 | Demonstrate the knowledge on the theory of microwave transmission, microwave generators and associated components | 3 | - | - | 3 | - | - | - | - | - | - | - | - | - | - | 1 |
| 2 | Analyse the microwave passive devices and components | - | 2 | - | 3 | - | - | - | - | - | - | - | - | 2 | - | - |
| 3 | Incorporate microwave measurements and associated techniques with equipment | - | - | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 3 |
| 4 | Gain knowledge of the fundamentals on light transmission through fiber | - | 3 | - | 2 | - | - | - | - | - | - | - | - | - | - | 1 |
| 5 | Develop a basic optical communication system | - | 3 | - | - | 3 | - | - | - | - | - | - | - | 2 | - | - |
| 6 | Implement the working principle of microwave components, microwave measurements, optical sources, detector and fibers | - | - | 3 | - | 3 | - | - | - | - | - | - | - | - | - | 3 |

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| **Part – A**  **(5 × 10 = 50 Marks)**  **Instructions: Answer any FIVE Questions.** | | | | | |
| **Q. No.** | **Question** | **Marks** | **BL** | **CO** | **PO** |
| **1** | **(A)** A non reciprocal device whose power flow is only from the nth port to the (n+1)th port in one direction is a  (a)Directional coupler  (b) Isolator  (c) Circulator  (d) Attenuator  **(B)** What are the advantages of S-Parameters compared with Y or Z parameters?  **(C)** A 20 dB directional coupler is found to be given 3 dB as output power through a coupled port.If the isolation is specified as  55 dB, find the power available at the isolated port. | 1  3  6 | 1  1  2 | 2  2  2 | 4  4  2 |
| **2** | **(A)** The dominant TE mode in rectangular waveguides is  (a) TE01  (b) TE11  (c) TE20  (d)TE10  **(B)** Name the device which uses a dielectric slab to introduce a modification in the phase with respect to electric field distribution along the waveguide. Enumerate its working with a neat diagram.  **(C)** An air-filled rectangular waveguide has dimensions a=5 cm and b=3 cm.The signal frequency is 6GHz. Compute the cut-off frequency and cut-off wavelength for the TM11 mode | 1  6      3 | 1  3  2 | 2  2  2 | 4  4  2 |
| **3** | **(A)**  Which of the following ports are isolated ports in a hybrid TEE  (a) Port 1 and 2  (b) Port 2 and 4  (c) Port 1 and 3  (d) Port 1 and 4  **(B)** In a microwave passive device,when waves enter through the side arm,the waves that leave the main arms are equal in magnitude and opposite in phase. Identify the device,explain its operation with neat diagram and derive its S-Matrix.Also prove that it is a 3-dB splitter | 1  9 | 1  3 | 2  2 | 4  4 |
| **4** | **(A)** A transmission line must be matched to the load to  (a) transfer maximum voltage to the load  (b) transfer maximum power to the load  (c) reduce the load current  (d) transfer maximum current to the load  **(B)** Identify the device which completely absorbs the power for propagation in one direction and provides lossless transmission in the opposite direction.Explain its operation and write its scattering matrix.  **(C)** Name the device which is used to adjust the power level of the microwave signal.With suitable diagram,explain the method where,the reduction in power level is measured accurately even if the power level is larger. | 1  4  5 | 1  2  3 | 2  2  3 | 4  3  3 |
| **5** | **(A)** Baretters have  (a) Positive temperature coefficient of resistance  (b) Negative temperature coefficient of resistance  (c) Both positive and negative temperature coefficient of resistance  (d) Neither positive nor negative temperature coefficient of  resistance  **(B)** Consider a microwave source fed to a microstrip load. Both the source and load is not perfectly matched to each other and hence standing waves are produced whose Vmax is 2.5V and Vmin is 1V measured from the slotted section at the distance of 8.5cm and 7.5cm respectively. The generator transfers an input power of 15dB and the load produces an output power of 12dB and it reflects 3dB power back to the source. Find the wavelength, SWR, reflection coefficient, attenuation loss and insertion loss | 1  9 | 1  3 | 3  3 | 3  3 |
| **6** | **(A)** Which method use short circuit plunger to measure scattering parameters?  (a) Deschamps method  (b) Slottedline method  (c) Cavity perturbation method  (d) Waveguide method  **(B)** Name the method which determines voltage reflection coefficient for frequency selectivity measurement of a reflection cavity.Explain it with a neat diagram.  **(C)** Identify the method used to measure VSWR whose value is greater than 10.Explain the same with proper graphical representation. | 1  5  4 | 1  3  2 | 3  3  3 | 3  3  3 |
| **7** | **(A)** While measuring impedance of the line to the right of voltage minimum indicates  (a) Inductive impedance (b) Capacitive impedance  (c) High impedance (d) Low impedance  **(B)** Explain the frequency measurement technique which uses cylindrical cavity and movable short with suitable diagram. | 1  9 | 1  3 | 3  3 | 3  3 |

**Course Outcome (CO) and Bloom’s level (BL) Coverage in Questions**

**Evaluation Sheet**

**Name of the Student:**

**Register No.:**

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| **Part - A (5 × 10 = 70 Marks)** | | | | | |
| **Q. No.** | **CO** | **PO** | **Max. Marks** | **Marks Obtained** | **Total** |
| **1 (A)** |  |  |  |  |  |
| **1 (B)** |  |  |  |  |
| **1 (C)** |  |  |  |  |
| **2 (A)** |  |  |  |  |
| **2 (B)** |  |  |  |  |
| **2 (C)** |  |  |  |  |
| **3 (A)** |  |  |  |  |
| **3 (B)** |  |  |  |  |
| **4 (A)** |  |  |  |  |
| **4 (B)** |  |  |  |  |
| **4 (C)** |  |  |  |  |
| **5 (A)** |  |  |  |  |
| **5 (B)** |  |  |  |  |
| **6 (A)** |  |  |  |  |
| **6 (B)** |  |  |  |  |
| **6 (C)** |  |  |  |  |
| **7(A)** |  |  |  |  |
| **7(B)** |  |  |  |  |

**Consolidated Marks:**

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| **CO** | **Max. Marks** | **Marks Obtained** |  | **PO** | **Max. Marks** | **Marks Obtained** |
| **2** | **35** |  |  | **2** | **9** |  |
| **3** | **35** |  |  | **3** | **39** |  |
| **Total** | **70** |  |  | **4** | **22** |  |
|  |  |  |  | **Total** | **70** |  |

**Signature of the Course teacher**