SRM Institute of Science and Technology
College of Engineering and Technology

Batch-1
SET-A

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: 8.00 AM–9.40 AM**
Year & Sem: III / VI   **Max. Marks: 50**

	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

Part – A
(5 × 10 = 50 Marks)
Instructions: Answer any FIVE Questions.

Q. No.	Question	Marks	BL	CO	PO
1	**(A)** In the Tee junction, if the arm parallel to the H field is fed with power P, then what will be the power at the remaining ports? (a) P/4 at each port (b) P/3 at each port (c) P/2 at each port (d) 2P at each port	1	1	2	2
	(B) Why conventional parameters (H, Y, Z) cannot be used for microwave frequency measurement?	3	1	2	2
	(C) The incident power is 100 W for a directional coupler. It has a coupling factor of 25 dB and directivity of 40 dB. Find the coupled and isolated port power.	6	3	2	4
2	**(A)** In hollow rectangular waveguide_____ (a) The phase velocity is greater than the group velocity. (b) The phase velocity is less than group velocity. (c) The phase velocity is equal to the velocity of light in free space. (d) The phase velocity is equal to the group velocity.	1	2	2	2
	(B) The guided wavelength for a frequency of 20,000 MHz is 6 cm when the dominant mode is propagated in an air-filled rectangular waveguide. Find	9	3	2	4

	(i) The cut-off wavelength of the waveguide. (ii) The height of the waveguide. (iii) The width of the waveguide.				
3	**(A)** If port 3 and port 4 of a four-port circulator are terminated by the matched load, then the resultant device will have the characteristics of (a) Phase shifter (b) Attenuator (c) Isolator (d) Power divider	1	3	2	2
	(B) Design a non-reciprocal four-port transmission device using hybrid Tees and non-reciprocal $\frac{3\pi}{3}$ phase shifters and explain its working with S-matrix.	9	3	2	4
4	**(A)** What will be the outpower of a 3-dB power divider, when the input power is 1 dBm? (a) - 0.5 dBm at each port (b) 0.5 dB at each port (c) - 1 dBm at each port (d) -2 dBm at each port	1	3	2	2
	(B) If the input power of a microwave system is 100 dB. To reduce this power by 20 dB which device can be used? Name that device and briefly explain it.	4	3	2	2
	(C) Calculate the VSWR of a rectangular waveguide of 4 X 2.5 cm operating at 10 GHz. Assume that wave travelling in dominant mode inside the waveguide and the distance between twice minimum power point is 1mm.	5	3	3	3
5	**(A)** If the source impedance is perfectly matched with the load, then the value of the reflection coefficient and VSWR are respectively (a) 1,0 (b) 0,1 (c) 0,0 (d) 1,1	1	1	3	3
	(B) A microwave source is giving power in the 50 W range. Find out the sensor that can be used to measure this power and explain its measuring methods with a suitable diagram.	9	2	3	4
6	**(A)** The input power of a microwave transmission line is 50 dB. But due to impedance mismatch 4 dB power is reflected from the input port and the attenuation of the transmission line is 2 dB/m then what will be the output power of the transmission line of length 10 m? (a) 30 dB (b) 46 dB (c) 26 dB (d) 44 dB	1	3	3	4
	(B) Name the method that can be used to accurately measure the frequency of a microwave signal and explain it with a suitable diagram.	9	2	3	3

7	**(A)** The Deschamp's method is used for (a) ABCD Parameter measurement (b) Scattering parameter measurement (c) Quality factor measurement (d) Frequency measurement	1	1	3	3
	(B) Which parameter is used for frequency selectivity measurement of a cavity resonator and how will you measure that parameter through VSWR measurement, explain it.	9	2	3	3

Course Outcome (CO) and Bloom's level (BL) Coverage in Questions
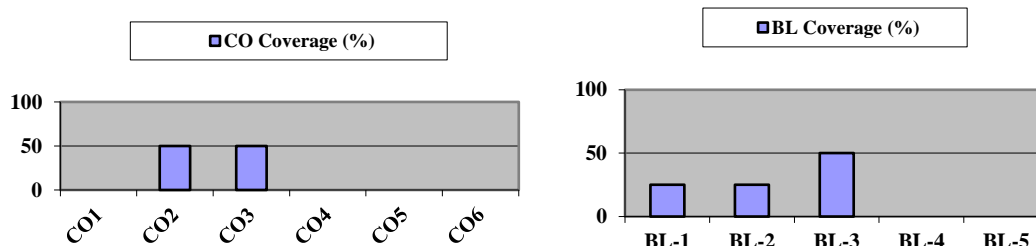
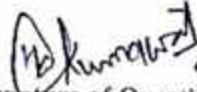## Evaluation Sheet

Name of the Student:

Register No.:

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)					
3 (A)					
3 (B)					
4 (A)					
4 (B)					
4 (C)					
5 (A)					
5 (B)					
6 (A)					
6 (B)					
7 (A)					
7 (B)					
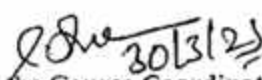
Consolidated Marks:

CO	Max. Marks	Marks Obtained
2	35	
3	35	
Total	70	

PO	Max. Marks	Marks Obtained
2	11	
3	25	
4	34	
Total	70	

Signature of the Course Teacher

30/3/23
Signature of Question Paper Setter
(Dr. Harish C. Kumawat)

30/3/23
Signature of the Course Coordinator
(S. SUHASIM)

Signature of the Academic Advisor