Reg. No.															

Question Paper Code	13418

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Seventh Semester

Electronics and Communication Engineering

20ECPC701 - RF AND MICROWAVE ENGINEERING

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	For a 2 port network to be reciprocal, it's scattering parameters must satisfy the following condition, for i = 1,2; j = 1,2. (a) $S_{ij} = S_{ji}(i \neq j)$ (b) $S_{ij} = S_{ji}(i=j)$ (c) $S_{ij} = 1/S_{ji}(i \neq j)$ (d) $S_{ij} \neq S_{ji}(i=j)$	1	K1	CO1
2.	The capacitor preferred at high frequency is (a) electrolyte capacitor (b) mica capacitor (c) air capacitor (d) glass capacitor	1	K1	CO1
3.	The mean length between discontinuities in a waveguide corner or bend should be _____. (a) Even quarter wavelength (b) Odd quarter wavelength (c) Full wavelength (d) Half wavelength	1	K1	CO2
4.	An isolator is called 'uniline' because (a) It can transmit power in multiple directions simultaneously (b) It can transmit power in only one direction (c) It is used in telecommunications networks (d) It eliminates signal reflections in a transmission line	1	K1	CO2
5.	The main advantage of a TWT over a klystron for microwave amplification is (a) Lower cost (b) Smaller size (c) Higher power (d) Wider bandwidth	1	K1	CO3
6.	A two-cavity klystron has a catcher cavity length of 10 cm. If the electron velocity is 5×10^6 m/s, what is the transit time? (a) 2 ns (b) 5 ns (c) 10 ns (d) 20 ns	1	K2	CO3
7.	The unit commonly used to express attenuation is (a) Watts (b) Volts (c) Decibels (dB) (d) Ampere	1	K1	CO4
8.	_____ is another name for a vector network analyzer (VNA). (a) Gain-phase meter (b) Automatic network analyzer (c) Spectrum analyzer (d) Tracking generator	1	K1	CO4
9.	IMPATT diode is a (a) negative resistance device (b) positive resistance device (c) zero resistance device (d) none of the mentioned	1	K1	CO5
10.	On a Smith chart, as you move towards the center of a noise figure circle, the value of the noise figure _____. (a) Decreases (b) Increases (c) Remains constant (d) Cannot be determined	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Define reciprocal and symmetrical networks.	2	K1	CO1
12.	Illustrate the equivalent circuit of high frequency capacitor.	2	K1	CO1
13.	Discuss the transmission characteristics of hybrid ring.	2	K1	CO2
14.	Define coupling factor and directivity of a directional coupler.	2	K1	CO2
15.	Mention the types of slow wave structures used in TWTA.	2	K1	CO3
16.	State the velocity modulation process with its equation.	2	K1	CO3
17.	Classify microwave powers with its range.	2	K1	CO4

18.	Define VSWR.		*2*	*K1*	*CO4*
19.	List the applications of microwave solid state devices.		*2*	*K1*	*CO5*
20.	State Gunn effect.		*2*	*K1*	*CO5*
21.	Discuss the operation of a microwave filter.		*2*	*K1*	*CO6*
22.	Calculate the VSWR of an amplifier if the amplifier has reflection coefficient 0.2533.		*2*	*K2*	*CO6*

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	State and prove the properties of S-matrix.	*11*	*K2*	*CO1*
		OR			
	b)	Discuss the functions of different passive components used at RF frequency.	*11*	*K2*	*CO1*
24.	a)	Examine the characteristics, applications and S-matrix of E-plane Tee junction in microwave Engineering.	*11*	*K2*	*CO2*
		OR			
	b)	Discuss the structure and principle of operation of circulator with its S-matrix.	*11*	*K2*	*CO2*
25.	a)	Explain the operation of two cavity Klystron amplifier and hence derive the equation for velocity modulation process with neat diagrams.	*11*	*K2*	*CO3*
		OR			
	b)	Describe the operation of cylindrical magnetron and hence derive its Hull's cutoff voltage equation.	*11*	*K2*	*CO3*
26.	a)	Discuss the impedance, wavelength and frequency measurement using slotted line method.	*11*	*K2*	*CO4*
		OR			
	b)	Discuss the functions of spectrum analyzer with neat block diagram.	*11*	*K2*	*CO4*
27.	a)	Explain the two-valley model theory with neat illustrations.	*11*	*K2*	*CO5*
		OR			
	b)	Illustrate the energy band diagram of Tunnel diode and explain the concept of tunneling.	*11*	*K2*	*CO5*
28.	a)	Derive the expression for input and output stability circles.	*11*	*K2*	*CO6*
		OR			
	b)	Derive the expressions for power gain, available gain and transducer gain a microwave amplifier using S-parameters.	*11*	*K2*	*CO6*