B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 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.	Which matrix is multiplied to find the overall transmission parameters of cascaded two-port networks? (a) Scattering matrix (b) Admittance matrix (c) Impedance matrix (d) Transmission matrix	1	K1	CO1
2.	In a lossless network, the elements of the impedance matrix are predominantly _____. (a) resistive (b) reactive (c) inductive (d) capacitive	1	K1	CO1
3.	How much phase shift does an isolator produce in forward junction? (a) 0^0 (b) 90^0 (c) 180^0 (d) 270^0	1	K1	CO2
4.	The power transmission from port 1 to port 4 in the microwave circulator is __. (a) Zero (b) Half the power (c) Equal to the power at port 1 (d) Double the power	1	K1	CO2
5.	The forward movement of the electron beam in a reflex klystron corresponds to the _____ cavity. (a) Buncher (b) Catcher (c) Input (d) Output	1	K1	CO3
6.	In a reflex klystron, if the Repeller potential is increased, what effect would it have on the velocity modulation of electrons? (a) Increase (b) Decrease (c) Unchanged (d) Uncertain	1	K1	CO3
7.	The unit commonly used to express attenuation is ___. (a) Watts (b) Volts (c) Decibels (d) Ampere	1	K1	CO4
8.	A transmission line has a VSWR of 2, the reflection coefficient is ___. (a) 1/3 (b) ½ (c) ¼ (d) zero	1	K2	CO4
9.	What is the maximum operating frequency if IMPATT diode? (a) 1 GHz (b) 100 MHz (c) 350 GHz (d) 20 GHz	1	K1	CO5
10.	The typical range for VSWR values in constant VSWR circles is between _____. (a) 0.5 and 1.5 (b) 1.5 and 2.5 (c) 2.5 and 3.5 (d) 3.5 and 4.5	1	K1	CO6

PART - B (12 × 2 = 24 Marks)
Answer ALL Questions

		Marks	K–Level	CO
11.	List the Radio Frequency bands available at microwave frequency range.	2	K1	CO1
12.	A 5dB attenuator is specified as having VSWR of 1.2. Assuming that the device is reciprocal, find the S parameters.	2	K2	CO1
13.	List the applications of Magic Tee junction.	2	K1	CO2
14.	Infer the need of isolator in a microwave network.	2	K2	CO2
15.	Define Transit time in Reflex Klystron.	2	K1	CO3
16.	Define Hull cut-off voltage with its equation.	2	K1	CO3
17.	State the importance of VSWR Measurement.	2	K1	CO4
18.	Define Q-factor.	2	K1	CO4
19.	Define pinch off voltage.	2	K1	CO5
20.	Outline the concept of Gunn effect.	2	K2	CO5
21.	Calculate the VSWR of an amplifier, if the amplifier has reflection coefficient 0.2533.	2	K2	CO6
22.	List the factors to be considered for a matching network.	2	K1	CO6

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **13848**

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a) (i)	Summarize the properties of S-matrix.	6	K2	CO1
	(ii)	Derive the reflection coefficient of two port network with mismatched load.	5	K2	CO1

OR

	b) (i)	Outline the concept of chip resistors and chip capacitors used at high frequency.	6	K2	CO1
	(ii)	Explain why it is impossible to construct a 3-port matched, lossless and reciprocal network.	5	K2	CO1

24.	a)	Explain the operation of E-Plane Tee junction and its characteristics with suitable applications. Also derive its S-matrix.	11	K2	CO2

OR

	b)	Interpret the function of circulator using directional coupler with neat sketch.	11	K2	CO2

25.	a)	Explain the construction details of TWT and also derive the expressions for its convection current.	11	K2	CO3

OR

	b)	Derive the expression for optimum distance required for bunching in two cavity Klystron amplifier.	11	K2	CO3

26.	a)	Develop the microwave setup for the measurement of Power and VSWR with neat diagram.	11	K3	CO4

OR

	b)	Construct the block diagram of Network analyzer and list its function.	11	K3	CO4

27.	a)	Illustrate the construction of HEMT with neat diagram and explain the principles of operation with its characteristics curves.	11	K2	CO5

OR

	b)	Explain the working of Tunnel diode and illustrate the concept of tunneling.	11	K2	CO5

28.	a)	Derive the expressions for power gain, available gain and transducer gain a microwave amplifier using S-parameters.	11	K3	CO6

OR

	b)	A microwave transistor has the following S parameters at 10GHz, with 50Ω reference impedance. $S_{11}=0.45\angle 150°$, $S_{12}=0.01\angle -10°$, $S_{21}=2.05\angle 10°$ and $S_{22}= 0.40 \angle -150°$ The source impedance is $Z_S = 20Ω$ and load impedance is $Z_L = 30Ω$. Compute the power gain, Available power gain and transducer power gain.	11	K3	CO6