Reg. No.

| Question Paper Code | 12580 |

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024
Seventh Semester
Electronics and Communication Engineering
20ECPC701 - RF AND MICROWAVE ENGINEERING
Regulations - 2020
(Use of Smith chart is permitted)

Duration: 3 Hours   Max. Marks: 100

PART - A (10 × 2 = 20 Marks)
Answer ALL Questions

		Marks	K-Level	CO
1.	Define lossless network.	2	K1	CO1
2.	What is the transmission matrix?	2	K1	CO1
3.	Why isolators are called uniline?	2	K2	CO2
4.	Give the S-matrix of directional coupler.	2	K1	CO2
5.	What is meant by Hull cut-off voltage?	2	K1	CO3
6.	List the applications of microwave generation.	2	K1	CO3
7.	Describe the errors in impedance measurement.	2	K2	CO4
8.	Define Q-factor.	2	K1	CO4
9.	What are the various modes of operations of the Gunn diodes?	2	K2	CO5
10.	Write the advantages of schottky diode.	2	K1	CO5

PART - B (5 × 13 = 65 Marks)
Answer ALL Questions

11. a) With the help of S matrix concept prove the following properties. (a) Symmetry (b) Unity (c) Zero (d) Phase Shift.   13   K2   CO1

OR

b) A four port network has the S matrix shown below: 13   K2   CO1

$$\begin{bmatrix} 0.1\angle 90° & 0.6\angle{-45°} & 0.6\angle 45° & 0 \\ 0.6\angle{-45°} & 0 & 0 & 0.6\angle 45° \\ 0.6\angle 45° & 0 & 0 & 0.6\angle{-45°} \\ 0 & 0.6\angle 45° & 0.6\angle{-45°} & 0 \end{bmatrix}$$

(i). Is this network lossless?
(ii). Is this network reciprocal?
(iii). What is the return loss of port 1 when all other ports are matched? Justify your answer.

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **12580**

12. a) What do you mean by S parameters? Why do we require S parameters? Draw the diagram of a directional coupler and explain its working. Derive s matrix of a directional coupler.   *13 K2 CO2*

OR

   b) Explain the properties of E-plane Tee and derive the S-matrix for the same.   *13 K2 CO2*

13. a) i) Explain the π mode of operation of Magnetron.   *8 K2 CO3*

     ii) What is meant by strapping in a Magnetron? Why it is done?   *5 K2 CO3*

OR

   b) With the Applegate diagram, describe the mechanism of operation of Two cavity klystron amplifier. Write the assumptions on which the analysis for RF amplification by this amplifier is based.   *13 K2 CO3*

14. a) i) Explain in detail about the construction and working principle of VSWR meter.   *8 K2 CO4*

     ii) Distinguish Network Analyzer and Spectrum Analyzer.   *5 K2 CO4*

OR

   b) What is a Network Analyzer? Discuss in detail about its types, architecture and its operation.   *13 K2 CO4*

15. a) With the aid of suitable sketch discuss construction materials characteristics and working of IMPATT diode.   *13 K2 CO5*

OR

   b) With the help of a two valley theory explain how negative resistance is created in Gunn diodes.   *13 K2 CO5*

PART - C (1 × 15 = 15 Marks)

16. a) Solve the following. A microwave transistor has the following S parameters at 10 GHz, with 50 Ω 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.   *15 K3 CO6*

OR

   b) Explain in detail about the High Electron Mobility Transistor and its functionality and response of analysis in temperature behaviour and noise performance.   *15 K3 CO6*