Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Winter 2022 - 23 Examination

Semester : 7 **Date: 06/10/2022**
Subject Code: 03107402 **Time: 10:30am to 1:00pm**
Subject Name: Microwave Engineering **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (Each of one mark) **(15)**

1. If a waveguide is filled with a lossless material of relative permeability 2, then the wave impedance in the TEM mode is

   a) 188.5 Ω b) 170 Ω
   c) 123 Ω d) 345 Ω

2. The mode of propagation in a microstrip line is

   a) Quasi TEM mode b) TEM mode
   c) TM mode d) TE mode

3. S parameters are expressed as a ratio of _____

   a) Voltage and current b) Impedance at different ports
   c) Indecent and the reflected voltage waves d) None of the mentioned

4. In order to obtain the resonant frequency of a rectangular waveguide, the closed cavity has to satisfy:

   a) Gaussian equation b) Helmholtz equation
   c) Ampere's law d) None of the mentioned

5. The major advantage of double stub tuning is:

   a) it uses 2 tuning stubs in fixed positions b) it involves 2 stubs
   c) length of the stub is variable d) None of the mentioned

6. A slotted line can be used to measure _____ and the distance of first _____ from the load.
7. If the reflection coefficient of a transmission line is 0.4, then the standing wave ratio is _____.
8. Scattering matrix for a lossless matrix is _____.
9. Double stub tuners are fabricated in coaxial line are connected in shunt with the main co-axial line. (True/False)
10. Microwave resonators can be constructed from open sections of waveguide. (True/False)
11. Conduction losses & Di-electric losses occur in a transmission line. (True/False)
12. Discontinuities in the matching quarter wave transformer are not of considerable amount and are negligible. (True/False)
13. List the applications of waveguide twist.
14. Define Two-port network.
15. Why is s-matrix used in MW analysis?

Q.2 Answer the following questions. (Attempt any three) **(15)**

A) Differentiate between klystrons and TWT

B) Define s-matrix and its properties?

C) What are the applications of reflex klystron?

D) What are the factors reducing efficiency of IMPATT diode?

Q.3 A) Explain in detail about 2-cavity klystron amplifier. **(07)**

B) Explain in detail about spectrum analyzer? **(08)**

OR

B) Write short note on Gunn Diode. **(08)**

Q.4 A) A Ku band IMPATT diode has a pulse operating voltage of 100 V and pulse operating current of 0.9 A. If the efficiency is about 10%, calculate the output power, the duty cycle if the pulse width is 0.01 ns and frequency is f = 16 GHz. **(07)**

OR

A) What is the purpose of slow wave structures used in TWT amplifiers? **(07)**

B) Write the applications of microwave engineering? **(08)**