Printed Pages: 02 **Sub Code: EIC-013**

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B.Tech.
(SEM VI) THEORY EXAMINATION 2017-18
Microwave Engineering & Measurements

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If you require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

a) Write down field components of TE_{11} mode of propagation?
b) What is CoupledStripLine?
c) What do you mean by directional coupler?
d) Explain circulators?
e) What are the limitation of active devices at microwave frequency?
f) Write down application of Backward Wave Oscillator?
g) Define Refection coefficient?
h) What is the use of VSWR?
i) What are the application of microwave FET?
j) What is tunneling effect?

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

a) What are the various ways in which wave guide canbe excited? Explain them with neat sketch?
b) Explain the construction, working and application ofCirculator based on Faraday rotation?
c) How does the bunching of electron take place in KlystronAmplifier? Derive an expression for bunching parameterof the Klystron?
d) What are Avalanche transit time devices? Explain IMPATTdiode in detail?
e) Explain double minima method for high VSWR Measurement in detail?

SECTION C

3. Attempt any *one* part of the following: **10 x 1 = 10**

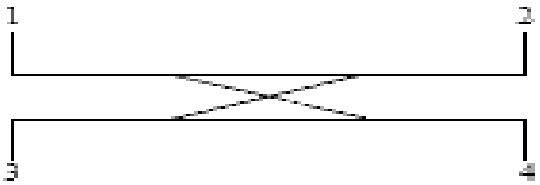
a) Derive an expression for power handling capacity of arectangular wave guide working in TE_{10} Mode. Thedominant mode TE_{10} is propagated in a rectangularwaveguide of dimensions a = 6 cm and b = 4 cm. Thedistance between a maximum and a minimum is 4.47 cm.Determine the signal frequency of the dominant mode?
b) Explain different microwave cavities?

4. Attempt any*one* part of the following: **10 x 1 = 10**

a) What are the properties of S-Matrix? Also write S-Matrixfor the following Microwave Components:
(i) Ideal Waveguide

(ii) Isolator.?

b) Define various parameters of directional coupler. With100 mW input power, the power measured at port 4 is0.1 mW and 10 mW when port 3 is terminated with amatched load and a short, respectively. Calculate thedirectivity of the coupler shown in the figure-



5. Attempt any *one* part of the following: 10 x 1 = 10

a) A two-cavity klystron amplifier has the followingparameters:
V_o = 1000 V R_o = 40 kΩI_o = 25 mA f = 3 GHzGap spacing in either cavity: d = 1 mmSpacing between the two cavities: L = 4 cm

Effective shunt impedance, excludingbeam loading: R_{sh} = 30 kΩ
(i) Find the input gap voltage to give maximum voltage V2.
(ii) Find the voltage gain, neglecting the beam loading inthe output cavity.
(iii) Find the efficiency of the amplifier, neglecting beamloading.?

b) Give the analysis of Reflex Klystron with schematicand Applegate diagram and explain the following effects:
(i) Velocity modulation process
(ii) Bunching.

6. Attempt any *one* part of the following: 10 x 1 = 10

a) What is PIN diode? Discuss its construction? How can it be used as a switch formicrowave application?

b) Explain GUNN oscillator in detail with neat sketch?

7. Attempt any *one* part of the following: 10 x 1 = 10

a) Explain the operating principle of crystal detector. Howit is used to measure microwave power in labs?

b) Describe the following methods for the measurement of attenuation:
(i) Power Ratio method
(ii) RF substitution method.