Code No. 6420 / N

FACULTY OF ENGINEERING

B.E. 4/4 (ECE) I – Semester (New) (Main) Examination, November 2013

Subject : Microwave Engineering

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part–A. Answer any FIVE questions from Part–B.

PART – A (25 Marks)

1. What are waveguides? What is the fundamental difference between the propagation in waveguides and propagation in transmission lines or free space. 3

2. Sketch E and H field distributions for TM_1 wave between parallel planes. 2

3. The TE_{10} mode is described as the dominant mode in rectangular waveguides. What property does it have which makes it dominant? Show the electric field distribution at the mouth of a rectangular waveguide carrying this mode. 3

4. Write down the expression for a Quality Factor (Q) of rectangular resonator operating in its dominant mode. 2

5. Why is a Hybrid E-H plane Tee referred to as magic Tee? 2

6. List the properties of S-matrix. 3

7. Distinguish between 'O' type and 'M' type microwave tubes. 2

8. What are the differences between TWT and Klystron Amplifiers? 3

9. A Gunn diode is working in transit time modes at 12 GHz. The domain charges move at a speed of 10^7 cm/s. Calculate the length of the device? 3

10. Mention some specific applications of IMPATT diode. 2

PART – B (50 Marks)

11.a) Derive an expression for the power transmitted between two parallel conducting planes in the TE_1 mode. 6

b) Prove that for small attenuations, the attenuation factor 4

$$\alpha = \frac{Power\ \cos t\ in\ guide\ per\ unit\ length}{2\ \text{power injected}}$$

12.a) Prove by Maxwell's equations that it is impossible for TEM wave to be propagated inside a conducting tube, whether cylindrical or rectangular. 6

b) A rectangular air filled copper waveguide with a 0.9 inch X0.4 inch cross section and 12 inch length is operated at 9.2 GHz with a dominant mode. Find cutoff frequency, guide wave length, phase velocity and characteristic impedance. 4

..2