FEDERAL UNIVERSITY OF TECHNOLOGY OWERRI
SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY
DEPARTMENT OF ELECTRICAL /ELECTRONIC ENGINEERING
2018/2019 RAIN SEMESTER EXAMINATION
ECE 502 ADVANCED ELECTRONIC II 24th October 2019

Instruction: Attempt Question number **5 (five)** (compulsory) and any other **3(three)** Unit: 3; Time: 3 hours

Question 1:

a. Analyses of S-parameter equation exemplifies at least 8 (eight) technical theorems or concepts. Outline them (8 marks)
b. Compare and contrast S-parameter with h-parameter as tools for signals transmission (6 marks)
c. Sketch the 2-port networks for h,y,z and s, and their basic parameters equations respectively (6 marks)

Question 2:

a. Explain the terms: Transverse-Electromagnetic Modes, Transverse Magnetic Modes and EH modes respectively (6 marks)
b. Show that $f = f_c\sqrt{1-\frac{\gamma^2}{h^2}}$, where $f_c = \frac{h}{2\pi\sqrt{\mu\epsilon}}$ of a waveguide (6 marks)
c. The longitudinal field component of WG modes are mathematically represented, thus; $E_z; H_z \propto e^{(wt-\gamma z)}$ ----(A)
   (i) From equation A, determine; f, γ, α, β and j
   (ii) State what happens when γ is real,and when γ is imaginary (assume WG has no dielectric losses) (8 marks)

Question 3

a. Describe the basic problem of electromagnetic compatibility? Hence what are the ways out of solving the problem (6 marks)
b. Outline (i) the two types of electromagnetic interference (ii) The two types of electromagnetic vulnerability tests and (iii) the two major tasks electronic engineers face on daily basis at the field (8 marks)
c. What is a microwave system? Briefly explain its background (6 marks)

Question 4

a. Briefly describe the 2-cavity klystron amplifiers. With the aid of an Applegate diagram and schematic diagram, show the essential components of a klystron and the voltages applied to the electrodes. (9 marks)
b. State the purpose of strapping in a magnetron. Then list three applications of a magnetron (5 marks)
c. What is a slow wave structure?, sketch it. Why is this structure necessary in TWT architecture? (6 marks)

Question 5

a. How can the following faults enlisted in (i-iv) be corrected in lumped line using lumped circuit techniques.
   (i) Reduced attenuation
   (ii) Reduced Z_0 and increased V_p
   (iii) To increase equivalent line capacitance
   (iv) To reduce equivalent line inductive
   } Sketch the Circuits (8 marks)

b. (i) State 2 properties of quarter-wavelength transformer
   (ii) Sketch open- and short –circuits stubs using their passive components analogies
   (iii) List 3 causes of attenuation in waveguides and their solutions
   (iv) Where can WG calibrated to operate below cut-off frequency be used in industries? (8 marks)

c. (i) Sketch a matching component that behave as both band-pass and band mode filters. Draw its RF equivalent circuits.
   (ii) How can capacitive and Inductive susceptances be achieved in Waveguide? Explain with diagram.
   (iii) Sketch the Iris component equivalent of the following passive semiconductors (a) Shunt capacitance (b) Shunt inductance (c) resonant circuit
   (v) State the main advantage of any waveguide Iris component what determines the model Eigen values and Evanescent modes of WG? Explain in a sentences each.
   (vi) Give three examples each of solid state devices (SSD) and quantum electronic devices (QED) respectively. (24 mrks)