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**International Islamic University Chittagong (IIUC)**  
**Department of Electronic and Telecommunications Engineering**  
**Mid Term Examination**

**Program: B.Sc (Engg)**  
**Course Code: ETE 4741**  
**Time: 1 Hour 30 mins**

**Semester: Spring 2022**  
**Course Title: Microwave Engineering**  
**Total Marks: 30**

**[Answer any three questions of the following sets]**  
**[Symbols used in the questions carry their usual meanings]**

1. a) Differentiate between Characteristic Impedance of Transmission Line and Line Impedance. Prove that when characteristic impedance becomes equal to load impedance, input impedance of the line becomes equal to load impedance irrespective of the length of the line. CO1 4
- b) Explain how quarter wave transformer achieves impedance matching with any desired input impedance. Point out the condition that must be fulfilled for achieving it. CO2 3
- c) What does it mean by Lossless line? Justify the assumption of Microwave Transmission lines as lossless lines. CO1 3
2. a) A load impedance of  $100 + j50\Omega$  terminates a  $50\Omega$  Transmission Line that is  $0.4\lambda$  long. Determine:
  - I. Reflection Co-efficient
  - II. VSWR
  - III. The load admittance
  - IV.  $Z_{in}$  at the generator
  - V. Locations of  $V_{max}$  and  $V_{min}$  with respect to loadCO2 6
- b) A  $50\Omega$  lossless line is to be matched to a  $25 - j50\Omega$  load with a shorted stub. Determine the stub length, its distance from the load, and the necessary stub admittance. CO2 4
3. a) Analyze the Rectangular waveguide for TE mode of Propagation. CO2 5
- b) Differentiate between TEM, TE and TM modes of waves. CO1 3
- d) Explain why TEM mode is possible in parallel plate waveguide but not in rectangular waveguide. CO1 2
4. a) Justify the use of R,L,G and C in in modelling the equivalent circuit of Transmission Line. CO1 3
- b) Derive Telegrapher's equations for transmission line. CO2 4
- c) Differentiate between Electromagnetic Field, Circuit and Transmission line theory with respect to complexity and accuracy CO1 3