# The Islamia University of Bahawalpur

University College of Engineering & Technology

Department of Telecommunication Engineering

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| Final-Term Examination, Fall-2019 | Time Allowed:120 minutes |
| BSc. Telecommunication Engineering, 6th Semester | Max. Marks: 50 |
| Course: Microwave Engineering | Instructor: Dr. Abdul Aziz |

Note: Attempt All Questions.

| Sr. | Questions | Marks | CLO |
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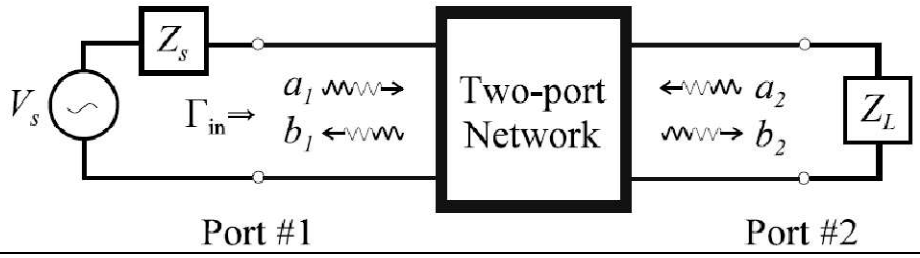
| **Q.No.1** | Differentiate between TE, TM, TEM and quasi TEM mode? Also mention which modes are possible in waveguide, coaxial cable, microstrip and stripline. | 2 | 1 |
| **Q.No.2** | What is essential difference between a waveguide and coaxial cable? Compare on the basis of losses and applications. | 2 | 1 |
| **Q.No.3** | Compare scattering matrix and transmission matrix on basis of their pros and cons. | 2 | 1 |
| **Q.No.4** | Differentiate between distortion and attenuation for a lossy transmission line. Also explain the difference between phase velocity and group velocity for a lossy transmission line. | 2 | 2 |
| **Q.No.5** | A microwave antenna feed network operating at 4 GHz requires a 50 Ω printed transmission line that is 20 λ long. Possible choices are (1) copper microstrip, with d = 0.18 cm, $\varepsilon_r$ = 2.20, and tan δ = 0.001, or (2) copper stripline, with b = 0.36 cm,$\varepsilon_r$ = 2.20, t = 0.01 mm, and tan δ = 0.001. Which line should be used if attenuation is to be minimized? | 6 | 2 |
| **Q.No.6** | Analyze the two-port network shown below using signal flow graph and determine $\Gamma_{in}$ in terms of scattering parameters.   | 6 | 2 |
| **Q.No.7** | A power divider has a source impedance of 50 Ω. Design a lossless T-junction for such divider and compare its characteristic impedance with similar 3-port resistive power divider. | 6 | 3 |
| **Q.No.8** | A 30 $dB_m$ power source is connected to the input of a directional coupler having a coupling factor of 30 dB, a directivity of 40 dB, and an insertion loss of 0.5 dB. If all ports are matched, analyze such directional coupler find the output powers (in dBm) at the through, coupled, and isolated ports. | 6 | 4 |
| **Q.No.9** | Design an air filled rectangular copper cavity resonator that has its first three resonant modes at the frequencies of 5, 6, and 7 GHz. Find the cavity dimensions that satisfy conditions of resonant frequencies for all the three modes. | 6 | 4 |
| **Q.No.10** | Design a low-pass filter for fabrication using microstrip lines. The specifications include a cutoff frequency of 5 GHz, an impedance of 50 Ω, and a third-order maximally flat response. Use and compare Richard's transformation with Kuroda identities and step impedance methods to transform lumped elements to microstrip lines. | 12 | 4 |

***Wish You Best of Luck!***