Name: ID No.:

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
FIRST SEMESTER 2022-23
EEE G581 RF AND MICROWAVE ENGINEERING
MID SEMESTER TEST (CLOSED BOOK)

Date: 03-10-2022 **Duration: 90 Minutes** **Max marks: 30**

Instruction: *Answer all questions*

1. Given a 100 Ω microstrip line with an effective dielectric constant of 1.65. (a) What length of this line will realize an input reactance equivalent to 5 pF capacitor at 2.45 GHz? (b) With the above line and length, how to realize an inductive reactance, and find that inductance [6 M]
2. Given a shunt element as in Fig. 1. Assume Z_0 is the reference impedance. The lines shown in the diagram are of negligible lengths. Using standard procedure, obtain the S-parameters [6M]

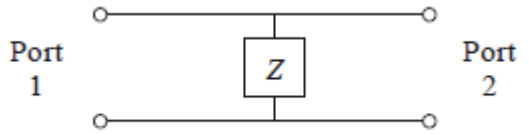

Figure 1

3. VNA calibration for a 1-port measurement uses a coaxial cable (symmetrical and reciprocal) and standard *open* and *matched* loads. The input reflection coefficient for the cable recorded by the VNA is 0.2−j0.5 for the *open* connection and 0.8+j0.1 for the *match*ed load connection at the frequency of interest. (a) Obtain the S-matrix for the cable (b) What would be the VNA reading if the cable is terminated by a *short* ? [8 M]
4. A load has reflection coefficient $0.5\angle 92^0$ when connected to a 75 Ω transmission line. (a) Using *only* the Smith chart, obtain the VSWR and load impedance (b) On the same Smith chart, mark the shortest distance (*d*) from the load for seeing a real impedance. *Attach the Smith chart with the answer sheet* (c) Design a quarter-wave transformer to connect between the above impedance and the 75 Ω transmission line (connected to the generator) for having zero reflections towards the generator [10 M]

END