



COLLEGE OF ENGINEERING, SCIENCE AND TECHNOLOGY
SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING

BACHELOR OF ENGINEERING PROGRAMME, YEAR 3 (BENG 3)

EEE 747 RADIO FREQUENCY PRINCIPLES

SUPPLEMENTARY EXAMINATION
(SEMESTER 1, 2017)

Duration – Three Hours (3 Hours)
DATE/TIME/ROOM – Refer to Timetable

INSTRUCTIONS TO CANDIDATES

1. You are allowed 10 minutes extra time during which you are not to write.
2. Begin each answer on a fresh new page and use both sides of the sheets.
3. Write your identification number on the top of each attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper etc. in their correct sequence and secure with string provided.
5. For all sheets of paper in which rough work has been done, cross it through and you must attach to your answer script.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.

SECTIONS	QUESTIONS	MARKS
A	10 Questions. All Compulsory	20
B	7 Questions. Do any six	60
C	1 Question Compulsory	20
Total		100

Total no of pages – 5 (including cover page)

SECTION A

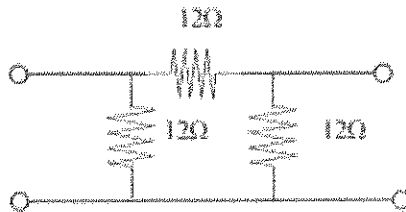
(20 Marks)

1. What is Impedance matching related to Transmission Line Theory?
2. State the relation between standing wave ratio S and reflection co-efficient k.
3. List any two applications of the smith chart.
4. What are the performance parameters of microwave resonator?
5. Define quality factor of a resonator?
6. A transmitter feeds a half-wave dipole antenna with 100 watts of power.
Calculate the Effective Isotropic Radiated Power (EIRP). ($G_1 = 1.64$)
7. Why are Rectangular Wave guides preferred over circular Waveguides?
8. What is a basic Difference between circulators and isolators?
9. What is single tone and multi tone modulation?
10. A sinusoidal voltage $V(t) = (200V)\sin(\omega t)$ is applied to a series RLC circuit with $L = 10.0 \text{ mH}$, $C = 100 \text{ nF}$, and $R = 20.0 \Omega$. Find the
 - (a) Resonant frequency,
 - (b) Amplitude of the current at resonance.

SECTION B

Question 1

If a 12-A source is connected at the input port of the network shown, find the current in a 4-ohm load resistor. (10 Marks)



Question 2

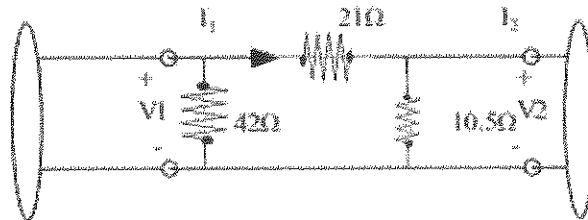
A Hartley Oscillator circuit having two individual inductors of 0.5mH each, are designed to resonate in parallel with a variable capacitor that can be adjusted between 100pF and 500pF. Determine the upper and lower frequencies of oscillation and also the Hartley oscillators bandwidth. (10 Marks)

Question 3

Design base resistor bias circuit for a CE amplifier such that operating point is $V_{CE} = 8V$ and $I_C = 2 \text{ mA}$. You are supplied with a fixed 15V d.c. supply and a silicon transistor with $\beta = 100$. Take base-emitter voltage $V_{BE} = 0.6V$. Calculate also the value of load resistance that would be employed. (10 Marks)

Question 4

Determine the Z parameters of the two port network shown



(10 Marks)

Question 5

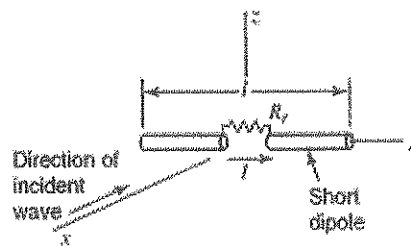
Explain the Voltage controlled Oscillator Design for Phase Lock Loops (PLL) using Varactor Diode

(10 Marks)

Question 6

A plane wave is incident on a short dipole as shown in Fig. The wave is assumed to be linearly polarized with E in the y direction. The current on the dipole is assumed constant and in the same phase over its entire length, and the terminating resistance R_T is assumed equal to the dipole radiation resistance R_R . The antenna loss resistance R_L is assumed equal to zero. What is

- (a) The dipole's maximum effective aperture and
- (b) Directivity?



Question 7

What is uniform linear array in antenna? Discuss the application of linear array? And

also explain the advantages and disadvantage of linear array?

(10 Marks)

SECTION C

20 Marks

Design a mobile phone communication system for Suva:

- a) What are the parameters to design a mobile communication system?
- b) What are the types of surveys to conduct these?
- c) Develop a flowchart for this system.

THE END