FIJI NATIONAL UNIVERSITY
College of Engineering, Science & Technology

SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

DIPLOMA IN ELECTRONIC & ELECTRICAL ENGINEERING

EEE559 – ELECTRONIC COMMUNICATION SYSTEM TECHNOLOGY

FINAL EXAMINATION – TRIMESTER 2, 2017

DURATION : 3 HOURS; TOTAL No of Pages: 7

INSTRUCTIONS TO STUDENTS

1 You are allowed 10 minutes extra reading time during which you are **NOT** to write.

2 **BEGIN each QUESTION** on a fresh page and use both sides of the sheet.

3 Write your ID number at the top of each attached sheet.

4 Insert all written foolscaps, graph paper etc. in their correct sequence and secure with a string.

5 For all sheets of paper on which rough/draft work has been done, cross it through and you must attach all of them to your answer scripts.

6 Write clearly the number(s) of the question(s) attempted on the top of each sheet.

7. **Attempt ALL QUESTIONS**

Section A: True OR False [10 marks]

Answer the questions by writing T if it's true and F if it's false, beside the question number in your answer sheet provided.

1. A Reactance Modulator is a typical solid state FM modulator circuit.
2. In a Phase Locked Loop (PLL) circuit, an increasing DC voltage out of the LPF causes the output frequency of the VCO to decrease.
3. The "demodulator circuit" is located in the transmitter and the circuit recovers the information signal.
4. TDM is the most common method employed in Fiber optic multiplexing
5. GEOs orbit at an altitude of 36,000 Km and support Fixed Satellite system requirements.
6. Any parallel LCR circuit becomes a resonant parallel circuit when the frequency of the applied AC voltage causes XL to equal XC.
7. The distance that direct waves travel is limited by the curvature of the Earth, hence the use of repeater stations for long distance communications.
8. Multiplexing is an area of signal processing which involves combining numerous information signals together.
9. Due to short wavelength of microwaves, microwave antennas can be readily designed for low gains and directivity.
10. One of the requirements for an oscillator to oscillate is to have a loop gain equal to unity.

SECTION B – SHORT ANSWERS **[30 Marks]**

1.	Discuss the differences between Packet switching and Circuit switching?	
2.	What is an "oscillator circuit" and list the two conditions an oscillator circuit must adhere to?	
3.	What are the main difference between a single-mode fiber and a multi-mode fiber cable?	
4.	What is a waveguide and explain where and how they are used in Communication?	
5.	What is the measure of the "efficiency" characteristic of a microwave antenna?	
6.	What is your understanding about a "Transmitter" in a Communication system and list the 3 basic functions of a transmitter?	
7.	Explain the reason why tubes like magnetron are used in microwave frequencies?	
8.	Explain how "horn antennas" are used to radiate electromagnetic energy?	
9.	What are the 3 main disadvantages of the use of microwave frequency?	
10.	Discuss the term "modulation" and the reason why modulation is required in Radio Communication.	
11	In your own words, define what "Filter Circuits" are and explain their use?	
12	Explain the term "Resonance" in Small Tuned Amplifiers, and determine the mathematical analysis for F_o; (the resonance frequency)	
13	What are the inputs to a modulator circuit and explain their differences?	
14	Discuss the terms "selectivity" and "sensitivity" as used in radio communication systems.	
15	What is Digital subscriber Line (DSL) Technology?	

Section C: Explanation & Calculation. [60 marks]

Answer ALL the questions

Question 1: PLL & Satellite Communication System

(a) i) Draw and label a block diagram of a Phase Lock Loop (PLL) system and briefly explain its operation (include type of signals at various points of the block). **[4 marks]**

ii) A common application of a PLL circuit is to demodulate FM signals. Explain in your own words how this can be achieved. Use block diagram to illustrate your answer. **[4 marks]**

(b) Todays technology provides several multi-access methods; explain FDMA and TDMA as used in satellite system. **[3 marks]**

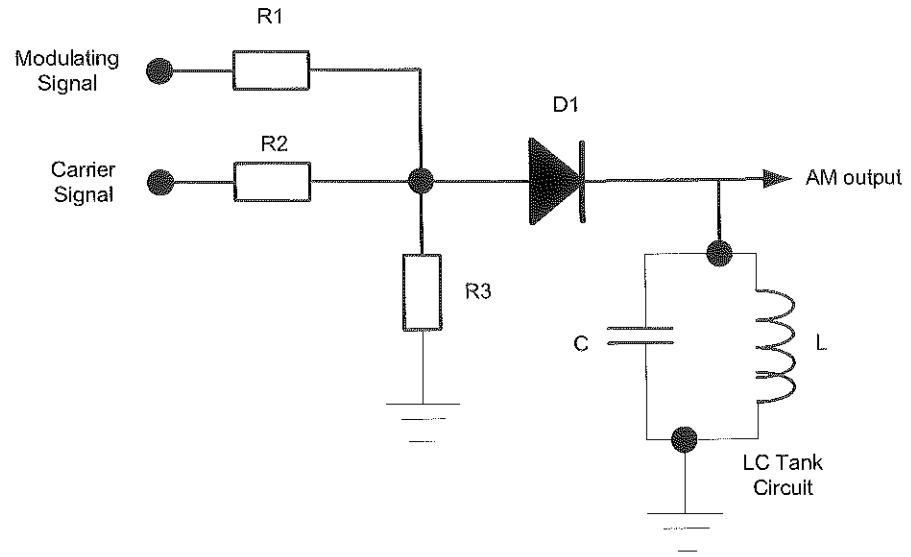
(c) Explain in your own words the following terms as relate to satellite communication system?

i) Geostationary Orbit
ii) GPS **[4 marks]**

(Total 15 Marks)

Question 2: Transmitter & Receiver System

(a) Refer to the circuit below.
Explain how AM can be produced from the circuit shown below? Include waveforms throughout the circuit



[5 marks]

(b) With the aid of a block diagram, draw, label and explain the operation of a Tuned Radio frequency (TRF) Receiver and the reasons why they are not used commercially as compared to Super-heterodyne receiver?
[5 marks]

(c) Explain the following terms as used in Communication system:

- Selectivity; Sensitivity, fidelity, double spotting & image frequency.

[5 marks]

(Total 15 marks)

Question 3: Microwave & Optical Fiber Communication System

a) The feed horn is the most commonly used antenna for microwave. What are the three main shapes that are used and the reasons they are shaped as such? **[3 marks]**

(b) Discuss the following terms as used in microwave antennas:
i) Efficiency
ii) Directivity
iii) Reciprocity **[6 marks]**

c) i). Draw and label a basic block diagram of a fiber-optic communication system and explain the function of each block. **[6 marks]**

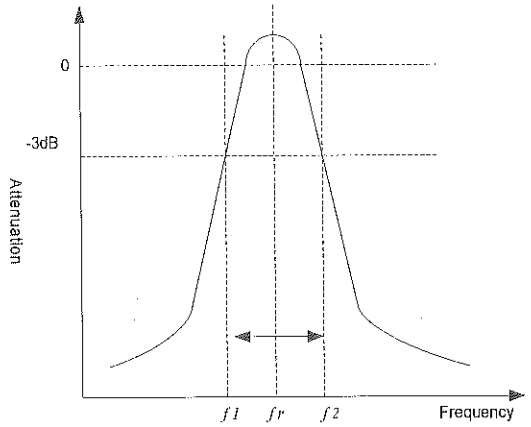
(Total 15 Marks)

Question 4: Oscillator, Small Signal Tuned Amplifier and Filters

a) Describe the operation of an oscillator circuit and the conditions to begin oscillation and sustaining it. **[4 marks]**

b) The figure below is a selectivity curve of a tuned LC circuit. If we assume L of 10μH with a resistance of 10Ω is connected in parallel with a 50pF capacitor, calculate the following:

i) the resonance frequency
ii) The Q of the circuit
iii)the Bandwidth of the circuit **[3 marks]**



c) Draw and explain a 'Frequency versus Reactance" response diagram of a parallel tank circuit. **[3 marks]**

d) What is the cut-off frequency of a single section RC LPF with R = 8.2KΩ and C = $0.0033_{\mu F}$. What does "cut-off frequency" ($F_{cut\text{-}off}$) mean? Sketch and explain. **[5 marks]**

(Total 15 marks)

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