FNU FIJI NATIONAL UNIVERSITY

COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY (CEST)

SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

CERTIFICATE IV IN ELECTRONIC ENGINEERING

EEE415 – ELECTRONIC COMMUNICATIONS SYSTEM 1

FINAL EXAMINATION – TRIMESTER 2, 2016

DAY/DATE: as per timetable. TIME: 2 HOURS 10 MINUTES

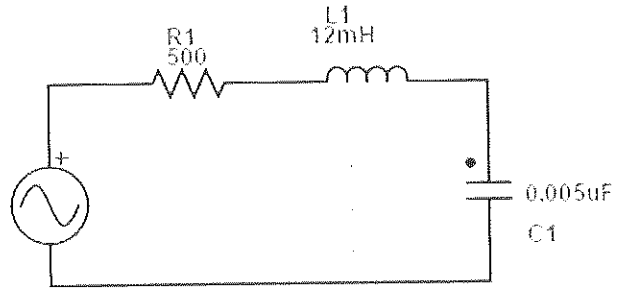
ROOM: as per timetable. MAXIMUM MARKS: 100

INSTRUCTIONS TO STUDENTS

1. *You are allowed 10 minutes Extra reading time during which you are NOT to write.*
2. *Begin each section on a fresh page and use both sides of the sheet.*
3. *Write your candidate-number at the top of each attached sheet.*
4. *Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with string.*
5. *For all sheets of paper on which rough/draft work has been done, cross it though and you MUST ATTACH to your answer scripts.*
6. *Write clearly the number(s) of the question(s) attempted on the top of each sheet.*
7. *ANSWER ALL QUESTIONS.*
8. *Show all workings where necessary.*
9. *Do not use programmable calculators, especially the ones that does the conversions of number systems.*
10. ***ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE ROOM!***

SECTION A: MULTIPLE CHOICE [15 MARKS]

1. The type of noise that is often produced by spark-producing equipment is known as:
   A. man-made noise.
   B. atmospheric noise.
   C. thermal noise.
   D. transistor noise.



2. The impedance of the resonant circuit given above is:
   A. 1553 ohms.
   B. 2053 ohms.
   C. 500 ohms.
   D. 1632 ohms.

3. A square wave is made up of a summation of:
   A. ramps
   B. sinusoids
   C. rectangle waves
   D. pulses

4. The reason modulation is used in electronic communication is:
   A. Since all intelligence signals occur at approximately the same frequency, there would be catastrophic interference problems if these frequencies were used.
   B. Audio frequency radio waves do not propagate long distances very reliably.
   C. Efficient transmission and reception of radio waves are not possible unless extremely large antennas are used.
   D. All of the above.

5. In a superheterodyne receiver the bulk of the receiver's sensitivity and selectivity is done at the:
   A. RF amplifier stages.
   B. converter stages.
   C. IF amplifier stages.
   D. local oscillator.

6. Voltage gain in decibels is
   A. 10 ln $\frac{V_{out}}{V_{in}}$
   B. 10 log $\frac{V_{out}}{V_{in}}$
   C. 20 ln $\frac{V_{out}}{V_{in}}$
   D. 20 log $\frac{V_{out}}{V_{in}}$

7. GSM is the digital standard for Europe. What do the letters *GSM* currently mean?
   A. Global Special Mobile
   B. Greater System's Mobile
   C. Global Systems for Mobile Communications
   D. none of the above!

8. A satellite stays in orbit without falling into the earth because the following two factors are balanced
   A. Satellite weight and speed
   B. Gravitational pull and inertia
   C. Centripetal force and speed
   D. Satellite weight and the pull of the moon and sun

9. The point in an orbit which is located farthest from earth?
   A. Perigee
   B. Apogee
   C. Line of apsides
   D. Point of shoot

10. What determines antenna polarization?
    A. The frequency of the radiated wave
    B. The direction of the radiated wave
    C. The direction of the magnetic field vector
    D. The direction of the electric field vector

11. A modem is
    A. a form of commutator
    B. a device for digitizing speech
    C. a circuit used for suppressing microwave interference
    D. an electronic circuit which carries out modulation and demodulation of a carrier frequency

12. Which of the following is present in both TRF receiver and superheterodyne receiver?
    A. Detector
    B. Mixer
    C. IF amplifier
    D. Local oscillator

13. The best solution to fading is _____.
    A. space diversity
    B. frequency diversity
    C. polarization diversity
    D. wavelength diversity

14. The medium which reflects high frequency radio waves back to the earth's surface is call the:
    A. biosphere
    B. stratosphere
    C. ionosphere
    D. troposphere

15. It is the angle between the earth's equatorial plane and the orbital plane of the satellite measured counterclockwise.
    A. Angle of elevation
    B. Angle of inclination
    C. Angle of azimuth
    D. Angle of tetrahedron

SECTION B FILL IN THE BLANK [25 MARKS]

PART 1 [10 MARKS]

Fill in the blank cell of the table given below:

Name	Symbol	Frequency	Wavelength	Applications
	ELF			
	SLF			
	MF			
	VHF			
Ultra high frequency	UHF	300 to 3000 MHz	10 cm to 100 cm	broadcast television, mobile telephones, wireless networking, remote keyless entry for automobiles, microwave ovens, GPR
	EHF			

PART 2 [15 MARKS]

Choose the appropriate word from the list in the box to fill in the blanks on each statement below.

(reflection, Single SideBand Suppressed Carrier (SSB-SC), dielectric, tracking, serial, multiplexing, Quantization, analog, asynchronous, transponder, Frequency, propagation, intelligence, cell, medium)

1. If the amplitude of the carrier is decreased and one of the sidebands is completely eliminated, the resulting signal is referred to as _____.
2. In electronic communication I, the message is referred to as _____.
3. The communication channel is the _____ by which the electronic signal is sent from one place to another.
4. The area a base station covers is called a _____.
5. When a signal is applied to a transmission line, it appears at the other end of the line some time later because of the _____ delay.
6. The ratio of the reflected voltage wave to the incident voltage wave on a transmission line is called the _____ coefficient.
7. Start and stop bits are required in _____ communication.
8. During transmission, the distortion of the signal depends on _____ of the signal
9. Most antennas consist of a conductor and insulator, which may be _____ or it may be air.
10. A _____ is a device for receiving and rebroadcasting a signal.
11. Digital telephony always uses time division_____.
12. The difference between the decoded signal and the original is referred to as the _____ error.

13. In long distance data transmission system, the most preferable mode of communication is _____ transmission.
14. A basic telephone set is an _____ baseband transceiver.
15. _____ describes the alignment of the transponder when there is a slight movement of the ground station antenna.

SECTION C TRUE AND FALSE [10 MARKS]

1. Quantization noise is introduced when PCM method is used to convert analog signal to digital signal.
2. Digital Transmission is more prone to noise interference than analog Transmission.
3. Frequency reuse is a technique of reusing frequencies and channels within a communications system to improve capacity.
4. A different carrier frequency is used for each channel in Frequency Division multiplexing.
5. Phase modulation is more noise resistant compared to amplitude modulation.
6. A satellite in geo-synchronous orbit is a distance of 36000 miles from the equator of the earth.
7. A half –wave dipole is sometimes called a "Hertz" Antenna.
8. As assigned by the Federal Communications Commission, cellular radio systems operate in the VHF and UHF bands.
9. Another name for an FM demodulator is detector.
10. In transmission line applications, the speed of the signal in the transmission line is always slower than the speed of a signal in free space.

SECTION D SHORT/LONG ANSWER QUESTION [50 MARKS]

1. Define the term *isotropic antenna*. Draw its radiation pattern.
   i. in polar co-ordinate system
   ii. in rectangular co-ordinate system

   [3 marks]
2. Yagi Antennas are one of the most well-known directional antennas in use throughout the world. Give at least two advantages and disadvantages of yagi antennas?

   [4 marks]
3. There are three types of optical fiber configurations: single-mode step-index, multimode step-index, and multimode graded-index fiber. Compare and contrast single-mode fiber optic cable with multimode fiber optic cable. Given an application of each?

   [4 marks]
4. Sketch the typical cellular phone system and explain the operation of BSC, MSC and PTSN?

   [4 marks]
5. A mobile unit transmits 10 W power at a certain place. Express this power in terms of dBm?

   [2 marks]

6. The three most commonly used multiple accessing arrangements: frequency-division multiple accessing (FDMA), time-division multiple accessing (TDMA), and code-division multiple accessing (CDMA). Briefly explain these three modulation techniques?

[6 marks]

7. A receiver has a noise power bandwidth of 10 kHz. A resistor with the receiver input impedance is connected across the antenna terminals. What is the noise power contributed by this resistor in the receiver bandwidth? Assume temperature to be 35 degrees celsius.

[2 marks]

8. Sketch and briefly explain the three orbiting pattern of the satellite?

[3 marks]

9. Explain the difference between bit rate and baud rate?

[3 marks]

10. Explain what is MUX and DEMUX?

[3 marks]

11. List at least four type of multiplexing technologies?

[2 marks]

12. Define the following terms:
    i. troposphere,
    ii. ionosphere

[2 marks]

13. A transmission line has the properties of inductance, capacitance, and resistance. Explain how does a two wire transmission line behave like an inductor, capacitor and resistor?

[6 marks]

14. i. Draw and label a block diagram of a tuned radio frequency receiver (TRF).

[2 marks]

ii. State four advantages of superhetrodyne receiver over TRF.

[2 marks]

15. The output of an amplifier is 1.3 mV rms and the noise was 0.512mV rms. Find the signal-to-noise ratio (SNR)?

[2 marks]

----------THE END----------

FNU FIJI NATIONAL UNIVERSITY

FNU/E-5

EQP RECEIPT CHECKLIST FORM

Particulars		Details/Comments (To be filled by Unit Lecturer)	Tick if present on EQP (To be filled by exams staff)
Cover Page			
Fiji National University with Logo		✓	
College		✓	
School		✓	
Program		✓	
Unit Code		✓	
Unit Name		✓	
Examination Period		✓	
Duration of Examination		✓	
Instructions		✓	
Total Number of Pages		✓	
Other Pages			
Footer	Page Number	✓	
	Unit Code	✓	
	Examination Period	✓	
Last Page			
The End		✓	
Overall			
Proper Print		✓	
Examination Requirements (FNU/E-1)		✓	
Moderator's Report (FNU/E-3)		✓	
ERRS (Class List)		✓	
Unit Coordinator/Principal Lecturer's Name		ALLES IN EXAMS	

DISPATCHED BY (SCHOOL REP)

NAME: _____

SIGN _____

DATE: _____

RECEIVED BY (EXAMS REP)

NAME: _____

SIGN: _____

DATE _____