



College of Engineering, Science and Technology  
School of Electrical and Electronics Engineering

**Bachelor of Engineering**  
**(Telecommunication and Networking)**  
**BENG – Year 3**

## **EEE748 – Telecommunication Systems**

Semester 1, 2016

Date: 13<sup>th</sup> June 2016      Time: 9:00AM to 12:10PM  
Duration – 3 h 10 min (Including 10 min reading time)

Total Marks – 100

Instructions to candidates:

- 1) You are allowed 10 minutes extra reading time during which you are NOT allowed to write.
- 2) Begin each answer 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 full-scapes, 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 through and you must attach all of them to your answer scripts.
- 6) Write clearly the number(s) of the questions(s) attempted on the top of each sheet.
- 7) There are two sections – both are compulsory.
- 8) There are alternative sub-questions within some questions.
- 9) Start your answer for a new question on new page.
- 10) Use of mobile phones or other programmable electronic gadget/storage device is NOT ALLOWED

- *Total Number of pages – 03 (Three) including this cover page*

## SECTION A – SHORT ANSWER QUESTIONS

[Section A - Total 50 Marks]

Note: All questions in this section are compulsory.

- A1) i) In Fiji, for the Amplitude Modulation (AM) or the MW band, the station operates at a frequency of 558 kHz. The carrier is modulated with a modulating signal of 3 kHz. Calculate the upper and lower sideband frequencies (F<sub>usb</sub> and F<sub>lsb</sub>) and graphically show the frequencies of this AM wave. [2.5 Marks]
- ii) In Suva, Mirchi-FM transmits its programs on 97.8 MHz. For a Super-heterodyne receiver if the IF frequency is 10.7 MHz, then calculate the Local Oscillator (LO) frequency? [2.5 Marks]
- A2) Calculate the total power in each sidebands of an AM wave when a carrier with 50W power is modulated to 70% modulation level. [5 Marks]
- A3) Compare the AM and FM modulations in Radio Communication [5 Marks]
- A4) Explain with suitable circuit diagram the working of Varactor Diode based Frequency Modulator (FM) circuit. [5 marks]
- A5) Draw the block diagram of a Tuned Radio Frequency (TRF) receiver and explain its working. [5 Marks]
- A6) Explain the working of a Slope Detector as FM Demodulator [5 Marks]
- A7) Write short notes on basic Software-Defined-Radio (SDR) [5 Marks]
- A8) Explain the working of Class-B / Push-Pull RF power amplifier [5 Marks]
- A9) Calculate a) the reactance of an inductor L with inductance 22  $\mu$ H, b) the reactance of 1 nF capacitor both at a signal frequency of 100 kHz and c) also calculate the series resonant frequency of this L-C circuit. [5 marks]
- A10) In an AM transmitter, a carrier with 1000W power is modulated to 100% level. Calculate the total power in the final AM wave and the power in each sideband. [5 Marks]

**\*\*\* End of Section A \*\*\***

## **SECTION B – LONG ANSWER QUESTIONS**

**[Section B - Total 50 Marks]**

**Note: Attempt any FIVE out of the following SEVEN questions from this section.**

- B1)** With the help of response curve describe various types of filters such as Low-Pass, High-Pass, Band-Pass and Band-Stop (Band-Reject). **[10 Marks]**
- B2)** Describe the process of Amplitude Modulation with proper definition, mathematical equations and associated waveforms. **[10 Marks]**
- B3)** Describe Side-Band Filter Method used in SSB (Single-Side-Band) generation. **[10 marks]**
- B4)** With a proper block diagram describe the working of a High-Power AM Radio Transmitter. **[10 marks]**
- B5)** Describe various receiver parameters such as Sensitivity, Selectivity, Noise, Dynamic Range and Signal-to-Noise-Ratio (SNR). **[10 Marks]**
- B6)** With a proper block diagram explain the working of the Super-heterodyne (Superhet) receiver and state function of each of the block. **[10 marks]**
- B7)** Draw the circuit diagram of a Balanced Modulator showing its signal waveforms and explain its working. **[10 Marks]**

**\*\*\* End of Section B \*\*\***

**\*\*\*\*\* End of Question Paper \*\*\*\*\***