## SECTION B - ANSWER ONLY THRE QUESTIONS

## Part One - Answer only one question in this part. [10 marks each]

- 1. a) What criterion is used to in indicate an FM signal is NBFM?
  - b) Draw and label block diagram of a typical communication system. Write short notes on anyone of the major blocks.
  - c) Can intelligent signal be sent without a carrier signal? Explain your answer.
  - d) The antenna current of an AM transmitter is 8 A when only carrier is sent, but it increases to 8.93 A when the carrier is modulated by a single sine wave. Find the percentage modulation. Determine the antenna current when the percentage modulation changes to 0.8.
- 2. a) Find the fundamental frequency of the periodic signal v(t) given by  $v(t) = e^{j2t} + \cos 3t \, V$ .
  - b) Sketch the two-sided amplitude spectrum of the signal v(t).
  - c) Calculate the average power of the signal.
  - d) Determine the energy and the power of the signal below. Discus your answers.

$$s(t) = \begin{cases} 2, & 0 \le t \le T/2 \\ 2+j & T/2 \le t \le T \\ j & T \le t \le 2T \end{cases}$$

## Part Two - Answer any two questions in this part. [10 marks each]

- 3. The equation for a FM wave is  $s(t) = 10\cos\left[5.7 \times 10^{\frac{8}{2}}t + 5\sin\left(12 \times 10^{3}\right)t\right]$ . Calculate
  - i. The carrier frequency
  - ii. Modulating frequency
  - iii. Modulation index
  - iv. Frequency deviation
  - v. Power dissipated in a 100  $\Omega$  resistor load.
- 4. For an FM modulator with a modulation index m = 1, a modulating signal  $V(t) = V_o \sin(2\pi 1000t)$  and an unmodulated carrier  $v_c = 10\sin(2\pi 500kt)$ :
  - i. (a) Determine the number of sets of significant side frequencies.
  - ii. (b) Determine their amplitudes.
  - iii. (c) Draw the frequency spectrum.
- 5. An AM signal modulated by a sinewave consist of a carrier voltage given by  $s(t) = 100\sin(2\pi 10^6 t) + 40\sin 9425t\sin(2\pi 10^6 t)$ .

Determine the following

- a) the modulation index
- b) the carrier frequency
  - c) the modulating signal frequency
  - d) the amplitude verse frequency plot of the modulated signal

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