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मधुर - 005

Communication Systems -I
(143105 / 183105 / 233105)

P. Pages : 2

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** sub-questions from each unit.
5. Assume suitable data wherever necessary and state the assumptions made.
6. Diagrams/sketches should be given wherever necessary.
7. Use of logarithmic table, drawing instruments and non programmable calculators is permitted.
8. Figures to the right indicate full marks.

UNIT - I

1. a) Draw and explain block diagram of basic communication system and describe need of modulation. 8
b) Derive relation of noise due to several amplifier in cascade. 8
c) The first stage of a two stage amplifier has output resistance of $40k\Omega$, voltage gain of 15, input resistor of 500Ω , and equivalent noise resistor of $2k\Omega$. The second stage has output resistor of $500k\Omega$, voltage gain of 20, input resistor of $80k\Omega$ and equivalent noise resistor of $10k\Omega$. Calculate equivalent i/p noise voltage given that the bandwidth of the amplifier is 10KHz and ambient temperature is 27°C . 8

UNIT - II

2. a) Derive the necessary equation to show that output of Amplitude modulation consist of carrier and pair of sideband. 8
b) An audio frequency signal $10 \sin 2\pi \times 500t$ is used to amplitude modulate a carrier of $50 \sin 2\pi \times 10^5$. Calculate
i) Modulation Index.
ii) Sideband frequencies.
iii) Amplitude of each sideband frequencies.
iv) Bandwidth required.
v) Total power delivered to the load of 600Ω . 8

- c) Explain single sideband generation by phase shift method. 8

UNIT - III

3. a) Compare frequency modulation and phase-modulation. 8

- b) For frequency modulation generation using field effect transistor prove that

$$C_{\text{equivalent}} = \frac{g_m}{2\pi F_n} \quad 8$$

- c) The center frequency of an L-C oscillator, to which a capacitive reactance FET modulator is connected, is 70 MHz. The FET has a g_m which varies linearly from 1 to 2 ms, and a bias capacitor whose reactance is 10 times the resistance of the bias resistor. If the fixed tuning capacitance across the oscillator coil is 25 PF, calculate the max. frequency deviation produced. 8

UNIT - IV

4. a) Explain Tuned Radio frequency receiver with proper block diagram. Also explain disadvantages of the TRF. 8

- b) Explain Bipolar Junction Transistor mixture with neat circuit diagram. 8

- c) In a broadcast superheterodyne receiver having no R.F. amplifier, the loaded Q of the antenna coupling is 80. If the intermediate frequency is 455 KHz, calculate

- i) The image frequency and its rejection ratio at 1000 KHz.

- ii) The image frequency and its rejection ratio at 50 MHz. 8

UNIT - V

5. a) Obtain Fourier Transform of

i) $x(t) = e^{-at} \mu(t)$

ii) $x(t) = e^{at} \mu(-t)$ and also plot their magnitude and phase spectrum. 8

- b) Enlist properties of Fourier Transform and prove any one property of Fourier Transform. 8

- c) Compare pulse modulation techniques. 8
