RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, AUGUST 2021

SECOND YEAR [BATCH 2019-22]

Date : 13/08/2021 **ELECTRONICS (GENERAL)**

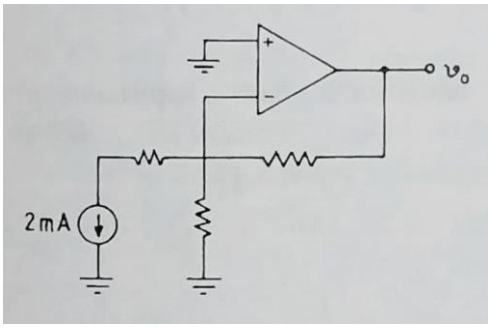
Time : 11.00 am - 1.00 pm **Paper : IV** Full Marks : 50

Answer **any five** questions of the following : [5×10]

1. a) What do you mean by CMRR of an OPAMP? Obtain an expression for CMRR in terms of difference signal gain and common-mode signal gain. Compare CMRR for an ideal and practical OPAMP. (1+3+1)

   b) Explain how a non-inverting amplifier can be converted to a unity gain buffer. Where do we use unity gain buffer? (1+1)

   c) Determine the output voltage v_o in the following circuit, where all the resistors are of 3 KΩ: (3)



2. a) State the working of a zero-crossing detector. What should be the output of the zero-crossing detector if its input is fed by a sinusoidal signal? (2+1)

   b) What is DAC? Why is R-2R ladder type DAC is preferred than weighted resistor type DAC? (1+1)

   c) State the working of a 'Counter controlled' ADC with suitable circuit diagram. (5)

3. a) Compare analog, digital and pulse modulation schemes. (3)

   b) What is amplitude modulation? Derive expressions of AM wave power for DSB & DSB-SC type modulation. (1+3)

   c) Consider an AM wave with 70% modulation. Calculate the percentage of power saved when SSB-SC is transmitted instead of DSB AM wave. (3)

4. a) Mention various types of angle modulation. Also compare them. (2)

   b) Explain how voltage controlled oscillator circuit can be used for the generation of FM signal. Mention what modification should be done to a FM generator so that it can be used for PM generation. (4+1)

   c) A carrier of frequency 120 MHz is frequency modulated by an audio signal of maximum frequency 20 KHz producing a maximum frequency deviation of 80 KHz. Find the transmission bandwidth and the frequencies of the first three significant pairs of sidebands. (3)

5. a) What are the various types of external noise? Mention how they are generated. (1+3)

   b) Calculate the noise voltage at the input of a television RF amplifier, using a device that has a 250 Ω equivalent noise resistance and a 350 Ω input resistance. The bandwidth of the amplifier is 5 MHz and consider the system is at room temperature. (2)

   c) Define noise figure and noise temperature, also give the relation between them. A receiver connected to an antenna whose resistance is 50 Ω has an equivalent noise resistance of 40 Ω. Calculate the receiver's noise figure and its equivalent noise temperature. (2+2)

6. a) What is PAM? How can PAM be generated? Discuss its demodulation scheme. (1+1.5+1.5)

   b) State how pulse code modulation scheme is implemented. (3)

   c) What do you mean by FSK? Explain how FSK is generated using one 2 X 1 MUX. Draw a schematic diagram of a coherent FSK detector. (1+1+1)

7. a) What is antenna? (1)

   b) Explain how space or tropospheric wave communication is taking place. In this context define selective fading, shadow zone and duct propagation. (3+3)

   c) An ionized layer exists at an altitude of 120 km above the surface of the earth. The electron concentration N (m^{-3}) in the layer increases linearly with height h (km), measured from the bottom of the layer following the relationship $N = 5.1 \text{ X } 10^{10} + 10^{9}h$. A radio wave of frequency 3 MHz is launched vertically upwards from the surface of the earth. Find the height of the point above the ground from which the wave is reflected back. (3)

8. Write short notes on **any four** of the following: [4×2.5]

   a) Virtual short in OPAMP

   b) OPAMP integrator circuit

   c) SSB-SC & its advantages

   d) Shot Noise

   e) Delta Modulation

   f) QPSK

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