

23-12-2015

Roll No.:



DOON UNIVERSITY, DEHRADUN

End Semester Examination, First Semester, 2015 School of Physical Sciences

M. Sc. - Physics
Course: PHC-405: Electronics

Time Allowed : 3 Hours

Maximum Marks : 50

Note: Attempt All Sections - A, B, C.

SECTION: A (Very Short Type Questions). All questions are compulsory.

(Marks: $1.5 \times 8 = 12$)

1. Define Fermi energy and Fermi level.
2. What do you understand by collector to emitter leakage current?
3. What do you mean by stabilization of operating point?
4. Write the essential features of a current amplifier.
5. Describe the temperature effect on barrier voltage in a PN junction.
6. Define β -rule which makes transistor circuit calculations quite quick and easy.
7. What is CMRR? Write the characteristics of Real OP-AMP.
8. At a room temperature, copper has free electron density of $8 \times 10^{23}/m^3$. Find electron drift velocity in a copper conductor having a cross-section of $10^{-6}m^2$ and carrying a current of 5.4A.

SECTION: B (Short Answer Type Questions). Attempt any five questions.

(Marks: $4 \times 5 = 20$)

9. What is power amplifier? Write a short note on Class-A and Class-B power amplifiers.
10. Draw the common collector static characteristics & explain its operation.
11. Explain the operation of a differential operational amplifier.

12. Write the advantage & limitations of integrated circuits (ICs).

13. Design an adder circuit using an OP-AMP to get the output expression as

$$V_0 = -(0.1V_1 + V_2 + 10V_3), \text{ and } V_0 = -\frac{1}{3}(V_1 + V_2 + V_3)$$

where V_1, V_2 & V_3 are the inputs.

14. Calculate the values of the LSB, MSB & full scale output for an 8-bit DAC for the 0 to 10V range.

15. What do you mean by the process of frequency modulation? Why is it necessary for the transmission of intelligence?

SECTION: C (Long Answer Type Questions). Attempt *all three* questions.

(Marks: $6 \times 3 = 18$)

16. What is amplifier coupling? Explain the following methods of coupling:

- (a) Resistance - Capacitance coupling
- (b) Impedance coupling
- (c) Transformer coupling

and also describe the amplifier technique using these coupling methods.

17. Draw the schematic block diagram of the basic OP-AMP with inverting & non-inverting inputs. Sketch their equivalent circuits. Describe the function of an OP-AMP as:

- (a) An inverter
- (b) An integrator
- (c) A differentiator.

18. Explain the circuit operation of 6-bit Weighted resistor DAC, R-2R ladder DAC and inverted R-2R ladder DAC.

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