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Credit Based VI Semester B.Sc. Degree Examination, September 2022
(2020 – 21 and Earlier Batches)
PHYSICS (Paper – VIII)
Electronics

Max. Marks : 80

Instructions :

- i) Answer questions from **all** Units.
- ii) Multiple choice questions must be answered in the **first** page of the answer book **only**.
- iii) **Scientific** calculators are **allowed**.

1. Answer the following questions by choosing the most appropriate answer. (1×10=10)

- i) In a Zener voltage regulator, the Zener diode is _____ biased.
 - a) Forward
 - b) Reverse
 - c) Both forward and reverse
 - d) Unbiased
- ii) CMRR of an OPAMP is 10^4 . Its value in dB is
 - a) 100
 - b) 40
 - c) 80
 - d) 60
- iii) For an OPAMP which of the following is true ? OPAMP amplifies.
 - a) DC signal
 - b) AC signal
 - c) Difference of two inputs
 - d) All [a), b) and c)]
- iv) A n-channel e-MOSFET can be operated with
 - a) Positive gate voltage only
 - b) Negative gate voltage only
 - c) Both positive and negative gate voltages
 - d) Gate voltage above threshold
- v) In a feedback amplifier feedback fraction is $1/4$. To obtain oscillation gain the amplifier is
 - a) +3
 - b) -3
 - c) -4
 - d) 4
- vi) Oscillators are the amplifiers with input supplied them is
 - a) 0
 - b) ∞
 - c) 1
 - d) -1

P.T.O.



- vii) OR gate produces output state 1 when
 - a) Both the inputs in state 0
 - b) Both the inputs and either of the inputs state 1
 - c) Either of the inputs state 1
 - d) Both the inputs in state 1
- viii) Serial shift register is the one in which data were entered
 - a) One bit at a time
 - b) All the bits at same time
 - c) More than two bits at a time
 - d) All of the above
- ix) In amplitude modulation, side bands contain _____ of useful power of total power AM transmitted.
 - a) 33.33%
 - b) 50.33%
 - c) 100%
 - d) 66.66%
- x) In satellite communication angular separation between three satellites to cover entire earth (except polar region) is
 - a) 60°
 - b) 120°
 - c) 180°
 - d) 90°

2. Answer **any five** of the following :

(2×5=10)

- i) Draw input and output wave forms of a full wave rectifier.
- ii) What are the values of cut off frequency and band width of IC 741 ?
- iii) Distinguish between BJT and FET.
- iv) Give any two comparisons between positive and negative feedbacks.
- v) Draw the logic diagram using NAND gates for the equation $Y = A + B$.
- vi) Give the truth table of half adder circuit.
- vii) Draw a block diagram for CRT.

PART – B

Unit – I

3. a) Construct Zener voltage regulator circuit and explain its working in terms of line regulations.

4

- b) Explain the concept of virtual ground. Construct OPAMP inverting amplifier and obtain expression for voltage gain.

6

OR

4. a) What are the characteristics of ideal OPAMP ? Describe any two characteristics of IC 741.

4

- b) Explain with a circuit diagram, the working of full wave bridge rectifier and obtain expressions for ripple factor and efficiency.

6



5. a) In a Zener voltage regulator, find line current, load current, Zener current and power dissipated across the load R_L from the data given below :

Given : $V_i = 50 \text{ V}$, $R_S = 5 \text{ K}\Omega$, $V_Z = 10 \text{ V}$ and $R_L = 5 \text{ K}\Omega$.

5

OR

- b) Using OPAMP it is required to design inverting and non-inverting amplifiers. For an input resistance of $1 \text{ k}\Omega$ and input voltage of 1 V , non-inverting amplifier produces output voltage of 6 V . Determine gain and feedback resistance of non-inverting amplifier. If same combination of resistors were maintained, what would be the gain of the inverting amplifier ?

5

Unit – II

6. a) Using concept of feedback obtain a condition for Barkhausen criterion.

4

- b) Using suitable diagrams give the construction and working of n-channel e-MOSFET.

6

OR

7. a) Explain drain and transfer characteristics of d-MOSFET.

4

- b) What is an oscillator ? With a circuit diagram explain the working of RC phase shift oscillator.

6

8. a) The voltage gain of an amplifier with 5% negative feedback is 100. What is the gain without feedback ? Also find the loop gain.

5

OR

- b) Using following experimental data of e-MOSFET find :

i) $V_{GS(th)}$ voltage

ii) AC drain resistance

iii) Trans-conductance

iv) Amplification factor.

5

$I_{D(ON)} = 4 \text{ mA}$, $k = 0.278 \text{ mAV}^{-2}$ at $V_{GS} = 6.793 \text{ V}$.			
$V_{GS} \text{ (V)}$	4	4	5
$V_{DS} \text{ (V)}$	7	12	12
$I_D \text{ (mA)}$	8	8.5	8.25



Unit – III

9. a) Construct RS flip-flop using NOR gate and explain its operation. **4**
 b) Construct and realize the logic patterns of NOT, AND, OR and XOR gates using NAND gate. Comment on the overall result. **6**
- OR
10. a) Using a block diagram explain the working of BCD to seven segment decoders. **4**
 b) Construct mod 10-decade counter. Use timing diagram and truth table to explain its working. **6**
11. a) Simplify the following Boolean equation and draw logical diagram for it.

$$Y = \overline{A}\overline{B} + \overline{A}BC + A\overline{B}\overline{C} + ABCD$$
 5
- OR
- b) Table given below shows output state 1 for following combination of inputs. Using sum of product method set SOP equation, simplify and draw logic diagram for it. **5**

A	B	Fundamental product
1	0	
0	1	
1	1	

Unit – IV

12. a) Describe any two applications of CRO. **4**
 b) Derive an expression for the instantaneous voltage of an AM wave and obtain an expression for total power in terms of Modulation index. **6**
- OR
13. a) What is demodulation ? Explain demodulation using diode detector. **4**
 b) Describe the role of ionosphere in sky wave propagation and explain :
 i) Skip distance
 ii) Maximum usable frequency. **6**
14. a) A sinusoidal carrier wave of frequency 10 MHz and amplitude of 60 V is amplitude modulated by 2 KHz wave with modulation index 40%. Find the side band frequencies and their amplitudes. What is the band width of modulated wave ? **5**
- OR
- b) An AM transmitter radiates radio-wave of 30 kW at modulation index 80%. Calculate the percentage of power associated with carrier wave and each of the side bands. **5**