Reg. No. | | | | | | | | | |

# BSCPHC 358

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

Time : 3 Hours 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**.*

PART – A

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 of 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

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 V, $R_S$ = 5 KΩ, $V_Z$ = 10 V and $R_L$ = 5 KΩ. **5**

OR

b) Using OPAMP it is required to design inverting and non-inverting amplifiers. For an input resistance of 1 kΩ 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 mA, k = 0.278 mAV$^{-2}$ at $V_{GS}$ = 6.793 V. | | | |
|---|---|---|---|
| $V_{GS}$ (V) | 4 | 4 | 5 |
| $V_{DS}$ (V) | 7 | 12 | 12 |
| $I_D$ (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.

    $Y = A\overline{B} + A\overline{BC} + AB\overline{CD} + ABCD$ **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**

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