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(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2023-24 ONLY)

SUBJECT CODE 23UPS 5E10

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : NOVEMBER 2025

B.Sc. – PHYSICS **MAXIMUM MARKS: 75**

SEMESTER: V **TIME : 3 HOURS**

PART – III

BASIC ELECTRONICS AND CIRCUITS SYSTEMS

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS. (K1)

1. If the resistance in a circuit is doubled and voltage remains the same, the current will…….
   a) Increase b) Decrease c) Remain the same d) Become zero
2. In a series circuit, the current is…….
   a) Different through each component b) Zero in all components
   c) The same through all components d) Dependent on voltage only
3. What is the main concept of feedback in amplifier circuits?
   a) Feeding the input signal to the output b) Using a separate power supply for each stage
   c) Feeding a portion of the output signal back to the input
   d) Blocking unwanted frequencies in the input
4. Which of the following is NOT a characteristic of an ideal operational amplifier?
   a) Infinite open-loop gain b) Infinite input impedance
   c) Zero output impedance d) Finite bandwidth
5. Which of the following statements about photodiodes is correct?
   a) Photodiodes generate current only when a forward bias is applied.
   b) Photodiodes operate by converting light into current via the photoelectric effect and usually work under reverse bias.
   c) Photodiodes have slower response time compared to phototransistors.
   d) Photodiodes are not sensitive to the wavelength of incident light.

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES (K2)

6. State one key difference between series and parallel circuits.
7. What type of bias is a Zener diode operated in for voltage regulation?
8. State Barkhausen Criterion for sustained oscillations in an electronic circuit.
9. What are the conditions for an ideal Op-Amp? .
10. Draw the symbol of Photodiodes**.**

SECTION – B (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

(K3)

11. a) State Kirchoff's current and voltage law.

(OR)

b) Explain how Norton's Theorem simplifies the analysis of a complex linear electrical circuit. Include the form of the equivalent circuit used in Norton's Theorem.

12. a) Describe the construction and working of a Full-Wave Rectifier using a center-tapped transformer and two diodes.

(OR)

b) Define clampers and explain their function.

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13. a) Describe the working of a Hartley oscillator and derive the expression for its frequency of Oscillation.

(OR)

b) Explain the effects of negative feedback in an amplifier and show how it improves the performance of the circuit.

14. a) Define (i) Bias current and (ii) Slew rate

(OR)

b) Draw the circuit diagram of an inverting amplifier using an operational amplifier. Derive the expression for its voltage gain

15. a) Explain the working principle of a phototransistor and describe its advantages over a photodiode.

(OR)

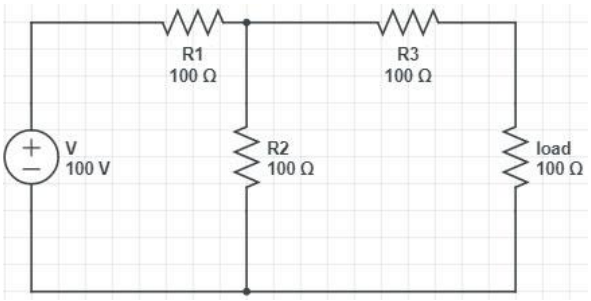
b) Explain the working of an electronic slave flash control circuit using a window detector.

SECTION – C (5 X 8 = 40 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

(K4 (Or) K5)

16. a) Illustrate the Thevenin's theorem to construct an equivalent circuit. Using Thevenin's theorem, find the current through the load resistor in the network shown in the below circuit.



(OR)

b) Determine the RMS current flowing through the circuit. Explain the relationship between voltage, current, and impedance in AC circuits.

17. a) What do you mean by biasing? Construct a proper voltage biased CE mode transistor circuit. And analyse its working.

(OR)

b) Describe the basic structure and operation of an n-channel JFET. Mention the roles of the Source (S), Drain (D), and Gate (G) terminals.

18. a) Analyze the working of a phase shift oscillator. Explain how the phase shift network and amplifier stage contribute to sustained oscillations.

(OR)

b) Analyze the operation of a single-stage common emitter amplifier circuit and explain how each component affects voltage gain and signal amplification.

19. a) Explain how an operational amplifier can be used to design an integrator circuit.

(OR)

b) Analyze the operation of a Subtractor circuit using an operational amplifier.

20. a) Analyze the structure of a photodetector and explain how the variation of resistance with light intensity affects its operation. Also, discuss the factors influencing the speed response of a photodetector.

(OR)

b) Evaluate the change under varying illumination in a photovoltaic cell. How does it affect the fill factor and overall efficiency of the solar cell?

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