Roll No.

PHY-504

Semiconductor Devices, Analog and Digital Electronics

M. Sc. PHYSICS (MSCPHY-12/13/16/17)

First Year, Examination, 2018

Time : 3 Hours

Max. Marks: 80

Note: This paper is of eighty (80) marks containing three (03) Sections A, B and C. Attempt the questions contained in these Sections according to the detailed instructions given therein.

Section-A

(Long Answer Type Questions)

- **Note :** Section 'A' contains four (04) long answer type questions of nineteen (19) marks each. Learners are required to answer *two* (02) questions only.
- 1. Show that the total current through a P-N junction diode due to application of a voltage V across the junction is given by $I = I_0 \left[e^{Ve} / \eta kT \right]$, where symbols have their usual meanings.
- 2. What is Operational Amplifier ? Give its configurations.
- 3. Give the theory of Logic Gates.
- 4. What is a multivibrator ? Draw the circuit of astable multivibrator and explain its operation.

Section-B

(Short Answer Type Questions)

- **Note :** Section 'B' contains eight (08) short answer type questions of eight (8) marks each. Learners are required to answer *four* (04) questions only.
- 1. Give the expression for potential barrier in junction diode.
- 2. Explain Zener and Avalanche breakdown.
- 3. What is an amplifier ? Explain the different types of amplifiers.
- 4. Give the concept of feedback. Derive relation for negative feedback.
- 5. Discuss the harmonic distortion in power amplifiers.
- 6. What is the push-pull connection ? State the main merits of this configuration.
- 7. Give various number systems used in digital electronics.
- 8. Give the Truth Table for binary addition.

Section-C

(Objective Type Questions)

- **Note :** Section 'C' contains ten (10) objective type questions of one (01) mark each. All the questions of this Section are compulsory.
- 1. Pure semiconductor material at a temperature of 0° K is :
 - (a) conductor
 - (b) a resistor
 - (c) a power source
 - (d) an insulator

- 2. Forward biasing a P-N junction :
 - (a) increases its resistance
 - (b) decreases its resistance
 - (c) shorts the junction
 - (d) increases the potential barrier
- 3. The ripple factor of a bridge rectifier is :
 - (a) 0.48
 - (b) 0.812
 - (c) 1.11
 - (d) 1.21
- 4. If a transistor were operated with emitter and collector interchanged, then :
 - (a) emitter current will increase
 - (b) base current will decrease
 - (c) collector current will increase
 - (d) no current flow will take place
- 5. As compared to the resistance of the source, the input impedance of a good voltage amplifier should be :
 - (a) high
 - (b) low
 - (c) equal
 - (d) twice
- 6. Maximum overall efficiency of a transistor coupled class-A amplifier is :
 - (a) 25%
 - (b) 50%
 - (c) 78.5%
 - (d) 90%

- 7. Positive feedback is used in :
 - (a) Rectifier
 - (b) Oscillator
 - (c) Amplifier
 - (d) Detector
- 8. For producing a 1 kHz signal, the most suitable circuit is :
 - (a) Tuned-collector oscillator
 - (b) Hartley oscillator
 - (c) Colpitts' oscillator
 - (d) Wien-Bridge oscillator
- 9. The input resistance of a MOSFET is of the order of :
 - (a) $1 M_{\Omega}$
 - (b) $10 M_{\Omega}$
 - (c) 100 Ω
 - (d) $10^4 \, \text{M} \, \Omega$
- 10. A UJT acts like :
 - (a) diode
 - (b) transistor
 - (c) diode and two resistors
 - (d) FET

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