



B.Sc. (Semester – V) Examination, October/November 2018
PHYSICS (Paper – I)
Electronics

Duration : 2 Hours

Total Marks : 80

Instructions : 1) **All** questions are **compulsory**.

2) Figures to the **right** indicate marks.

3) Symbols have their **usual** meaning unless otherwise stated.

4) Draw **neat** diagrams **wherever** necessary.

5) **Use** of calculator is **permitted**.

1. Answer **any four** of the following.

16

- Draw the circuit diagram of an inverter using a transistor. What is meant by hard saturation and soft saturation ?
- State any four characteristics of an ideal operational amplifier. Explain the concept of virtual ground in an operational amplifier.
- Draw the drain and transfer characteristics of N-channel JFET. What are the precautions to be taken while handling MOSFET ?
- Write the Boolean equations in two different forms for Ex-OR gate. Draw the logic circuit for each of them.
- Why is a Flip-Flop called a 1 bit register ? Draw a neat diagram for a clocked RS flip flop and explain its operation.
- Design a free running multivibrator using IC 555 timer for an oscillation frequency of 3 KHz and 60% duty cycle.

2. Answer **any four** of the following.

16

- What is Schmitt trigger ? Explain the terms : UTP, LTP and hysteresis for a Schmitt trigger circuit using transistors.
- Draw the circuit diagram for FET as Phase shift oscillator. Write down the formula for its frequency of oscillation and feedback factor.

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- c) With the help of circuit diagram, explain the working of operational amplifier as half wave rectifier.
- d) i) Convert the decimal number 97.8125 to binary number
ii) Convert the binary number 10101.11 to decimal number.
- e) A 555 timer is connected for ONE-SHORT operation. If $C = 0.01\mu\text{F}$, calculate the pulse width for $R = 33\text{ K}\Omega$ and $R = 47\text{ K}\Omega$.
- f) Convert the JK flip flop to D flip flop and T flip flop.

3. A) What is a JFET ? Explain the following parameters for JFET :

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- i) Drain resistance
- ii) Transconductance
- iii) Amplification factor.

OR

A) Draw and explain the drain and transfer characteristics for a Depletion MOSFET.

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B) What is an Astable multivibrator ? Draw the circuit diagram for an astable multivibrator using transistors. Sketch the nature of the voltage waveforms at the collector and base terminals of both the transistors.

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4. A) With the help of circuit diagram and waveform, explain the working of Op-amp triangular wave generator using Schmitt trigger and integrator.

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OR

A) Draw the circuit diagram of a pulse generator using Op-amp. Derive the expression for the pulse width.

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B) Draw the functional block diagram of astable multivibrator using IC 555 timer. Obtain the expression for its period of oscillation and duty cycle.

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5. A) What is a multiplexer ? Design a 4-1 multiplexer.

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OR

A) A three variable truth table has a high output for the following four input conditions :

(100), (010), (101) and (110). Write the sum of product equation and draw the sum of product logic diagram.

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B) State and prove De Morgan's theorem for two variables.

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6. A) Draw the circuit diagram of a 2 input TTL NAND gate and explain its operation with the help of truth table.

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OR

A) Show the block diagram of "Digital Voltmeter" and explain its working principle.

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B) With a neat circuit diagram, truth table and waveforms, explain the operation of MOD-3 counter.

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