



B.Sc. (Semester – V) Examination, October/November 2016
PHYSICS (Paper – 1)
Electronics

Duration : 2 Hours

Max. Marks : 80

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

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

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

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

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

(4×4=16)

i) Reduce the given Boolean function to Sum of Product (SOP) form and draw the AND-OR network.

$$Y = (A + \bar{B} + C) (\bar{A} + \bar{B} + \bar{C})$$

ii) Explain the operation of FET as Voltage Variable Resistor (VVR).

iii) Sketch the circuit of a Schmitt trigger using OP-AMP and explain its working.

iv) Draw the diagram of Mod-3 counter and explain its operation with truth table and waveforms.

v) Convert :

a) $(68.84)_{10} = (\underline{\hspace{2cm}})_2$

b) $(011011.1011)_2 = (\underline{\hspace{2cm}})_{10}$

vi) The OP-AMP integrator has input rectangular pulse of width 2 micro-second and height 6 volts. If $R = 1$ kilo-ohm and $C = 1$ micro-farad then find the output voltage at the end of the input pulse.

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

(4×4=16)

i) What is meant by Synchronous and Asynchronous counter ? How many Flip-flops are required to prepare Mod 89 counter ?

ii) Write the fundamental sum for three input truth table. Draw the wiring diagram for $Y = \bar{A}B + A\bar{B}$ using only four NAND gates.



- iii) Classify different types of FETs. State any four advantages of FET over BJT.
- iv) Sketch edge triggered D-type Flip-flop using J-K FF and explain its working.
- v) Calculate the output pulse width for the 555 timer as monostable with $R = 10 \text{ Kilo-Ohm}$ and $C = 0.1 \text{ micro-farad}$. What would be the value of C to change the pulse width to 10 mili-second ?
- vi) In case of transistorized astable multivibrator, if $R_{L1} = R_{L2} = 2k' \Omega$, $R_1 = 40k' \Omega$, $R_2 = 20k' \Omega$, $C_1 = 0.003 \text{ micro-farad}$ and $C_2 = 0.01 \text{ micro-farad}$. Determine the time period and frequency of oscillation.

3. a) Draw the cross sectional view of n-channel depletion type MOSFET. Explain its operation with the help of its characteristics to show that, it works in both depletion and enhancement mode.

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OR

- a) What is an astable multivibrator ? Draw the circuit of a transistorized astable multivibrator and explain its working with the help of output and capacitor waveforms.
 - b) Draw the circuit diagram of Schmitt trigger using transistors. Describe its operation when sine wave signal is applied at the input. Draw the graphical representation of Hysteresis of a Schmitt trigger.
4. a) Draw the circuit diagram of Pulse Generator using an OP-AMP and explain its working. Derive an expression for its pulse width.

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OR

- a) Draw the circuit diagram of a Triangular Wave Generator using OP-AMP. With the help of output waveforms, explain its operation.
- b) With the help of a schematic diagram, show how 555 timer can be used as a Square Wave Generator. Draw the output and capacitor waveforms. Find an expression for its time period.

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5. a) A three variable truth table has a high output for the input conditions 110, 111, 001 and 000. Write the Sum of Product (SOP) equation. Simplify it, draw the logic diagram and prove that, AND-OR is equal to NAND-NAND network. 6

OR

- a) State and prove DeMorgan theorems for two variables. 6
- b) Define XOR gate. Draw the diagram of full adder using two half adders. Write the truth table of full adder. 6
6. a) Explain the operation of Mod-5 counter with the help of block diagram, truth table and output waveforms. 6

OR

- a) Draw the J-K Master-Slave Flip-flop using logic gates and explain with the help of a truth table. 6
- b) What is multiplexer ? Draw the logic diagram of 4-to-1 line multiplexer using NAND gates and explain its working. 6