PYC 106

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B.Sc. (CBCS) (Semester V)
EXAMINATION NOVEMBER 2022
Physics
Analog and Digital 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.

Q.1 Answer any four from the following **(4×4=16)**

a) Draw the circuit diagram of voltage-controlled oscillator using transistors. Write an expression for the period of oscillations in terms of voltage.
b) Draw the drain and transfer characteristics of N-channel JFET. Why is the input impedance of JFET large?
c) What is the working principle of current regulating diode CRD.
d) Draw the circuit diagram of a voltage regulator using IC LM 317. Write the relation for its output voltage. Does the output voltage depend on input voltage?
e) Draw the functional block diagram of IC 555. State the function of each basic block of the timer.
f) What is meant by the terms UTP, LTP and Hysteresis as used in Schmitt trigger, what is the need for hysteresis in certain applications.

Q.2 Answer any four from the following **(4×4=16)**

a) Convert the decimal number 456.625 to binary and 10110 to BCD.
b) Write the Boolean expression, logical diagram for three input OR,AND, NOR and NAND gates.
c) Simplify the logical equations
(i) $Y = \bar{A}BC + A\bar{B}C + AB\bar{C} + ABC$
(ii) $Y = (\bar{A} + B)(A + B)$
d) Draw the logical circuit diagram for RS flip flop using NAND gates and briefly explain its working with a truth table.
e) Classify the registers upon the way the data is entered or retrieved. Draw the logical diagram of a four bit shift right register.
f) What do you mean by modulus of a counter? Calculate the number of Flip-flops required for counting 1000 pulses.

Q.3 A) What property of JFET is used in JFET voltmeter and AGC amplifier. Explain how can you use JFET as AGC? **6**

OR

A) Draw the circuit of JFET amplifier with common source and it's Thevenin's equivalent circuit at low frequencies. Write the expression for its voltage gain and input resistance. **6**

B) Draw the circuit diagram of a Schmitt trigger using transistors and explain its working. Write expression for the LTP and UTP and hence the hysteresis. 6

Q.4 A) With the help of circuit diagram and waveform using op-amp explain the working of astable multivibrator. Write the expression for frequency of oscillation. 6

OR

A) With the help of circuit diagram and waveform explain the working of op-amp triangular wave generator using Schmitt trigger and integrator. 6

B) Draw a circuit diagram of IC 555 when connected in monostable mode and obtain the expression for its pulse width. 6

Q.5 A) Discuss the use of NAND and NOR gates as universal building blocks in logic circuits. 6

OR

A) What is a multiplexer? Draw the circuit of a 3-1 digital multiplexer using basic logic gates. 6

B) Draw the circuit diagram of CMOSNAND gate and explain its operation. 6

Q.6 A) How will you convert clocked S-R Flip-Flop into a J-K Flip-Flop? Explain its working with truth table. 6

OR

A) Design a mod 5 counter using 3 JK Flip-Flops. Give the output waveforms at each stage. 6

B) Explain with block diagram, the working of a digital clock. 6