Third Semester Examination-2018

M.Sc. PHYSICS

Paper Code:PHS-303

Special Paper – I

Full Marks : 40 **Time: 2 Hours**

Use Separate scripts for Group A& Group B

Group A

(Electronics: Analog)

(Attempt question number 1 and any one from the rest.)

1. **Attempt any five of the following (Marks $2 \times 5 = 10$)**

   a) "A voltage controlled oscillator is nothing but an FM generator" – explain.

   b) Explain how a D-flip flop can be used as a digital phase detector.

   c) What are the advantages of a bridge amplifier over a simple stage amplifier?

   d) Explain how a PLL can be used for demodulation of a FM signal and is there any advantage of using this circuit over conventional FM discriminators?

   e) How a 7805 fixed voltage regulator IC can be used to generate 9V regulated output.

   f) Explain how a bridge power amplifier can deliver 4 times power output compared to a single stage power amplifier.

   g) Draw a circuit of a peak detector using OPAMP.

2. **a) Draw the circuit diagram of a 2^{nd} order low pass Butterworth filter and derive the expression for its transfer function. Will this circuit behave as a 2^{nd} order Butterworth filter for any value of gain? Explain. (5)**

   b) What is an instrumentation amplifier and why this is needed? Draw the circuit diagram of an instrumentation amplifier using 3 OPAMP and derive the expression for its output voltage in terms of input voltages. (5)

3. **a) Write the advantage of switching regulators over series regulators. Explain the detailed operation of a switching regulator with proper diagrams. (5)**

   b) Draw the circuit diagram of a voltage controlled oscillator using discrete components and derive the expression for its output frequency. (5)

Group B

(Electronics: Digital)

(Attempt question number 4 and any one from the rest.)

4. Attempt any five of the following (Marks $2 \times 5 = 10$)

a) **Determine the resolution of a 6 bit DAC in terms of percentage.**

b) **Why Emitter Coupled Logic (ECL) circuit is fastest among all logic families?**

c) **Why NMOS and PMOS are economical than CMOS?**

d) **A memory module contains 8192 bits. How many address lines will be required if the memory module is i) byte oriented and ii) bit oriented?**

e) **Cascade two 4-to-1 MUX IC chips to make an equivalent 8-to-1 MUX.**

f) **Why re-use principle is used in a GSM system?**

g) **What is a packet switching?**

5. a) Explain a CMOS logic circuit. Why is it so popular? (3+2)

b) Implement the function F= $\sum m(0, 1, 2, 4, 6, 8, 10, 12, 14)$ using CMOS logic. (5)

6. a) Show how you can use Emitter Coupled Logic (ECL) circuit as a NOR gate.

b) A 5-bit DAC produce an output of 0.1 V for a digital input of 00001. What is the output for an input of 10101.

c) Distinguish between multiplexer and demultiplexer.

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