Q.P. Code – 42631

Sixth Semester B.Sc. Degree Examination, April/May 2019

(Revised CBCS – 2018 Onwards)

Physics

Paper VII — EMBEDDED SYSTEM : INTRODUCTION TO MICROCONTROLLERS OP-AMP AND QUANTUM MECHANICS

Time : 3 Hours] *[Max. Marks : 90*

Instructions to Candidates : Answers should be written completely in English.

PART – A

I. Answer any **FIVE** of the following. Each question carries **8** marks. **(5 × 8 = 40)**

1. (a) What is an operational amplifier?

   (b) Explain with circuit how an op-amp functions as an non-inverting amplifier. **(1 + 7)**

2. (a) Mention the characteristics of an ideal op-amp.

   (b) Explain how op-amp can be used as a differentiator. Also derive an expression for its output. **(4 + 4)**

3. With a neat circuit diagram, explain the working of a phase shift oscillator. What are its disadvantages? **(8)**

4. Describe the internal architecture of the 8051 with schematic diagram. **(8)**

5. (a) List out the features of the 8051 microcontroller.

   (b) Discuss the function of various flags in PSW register. **(4 + 4)**

6. Explain the pin diagram of the 8051 micro controller. **(8)**

7. (a) Give the physical significance of a wave function.

   (b) Obtain the expression for the Schrodinger time dependent equation. **(2 + 6)**

8. Derive an expression for the time independent Schrodinger equation. **(8)**

PART – B

II. Answer any **SIX** of the following. Each question carries **5** marks. **(6 × 5 = 30)**

9. In the subtractor circuit $R_1 = 5k\Omega$, $R_f = 10k\Omega$, V_1 = 4V and V_2 = 5V. Find the value of the output voltage. V_1 and V_2 are potentials at the non-inverting and inverting terminals respectively.

10. Determine the output voltage of a differential amplifier for the input voltage of 300 μv and 240 μv. The differential gain of the amplifier is 5000 and the value of CMRR is 100.

11. An amplifier with negative feedback has a voltage gain of 100. It is found that without feedback, an input signal of 50 mV is required to produce a given output, whereas with feedback the input signal must be 0.6 V for the same output, calculate the value of A and B.

12. Write a program to add 25 H, 34 H and 12 H using 8051 assembly language.

13. Write a program to multiply two 8 bit numbers stored at location 70 H and 71 H and store the result at memory locations 52 H and 53 H.

14. Find the probability that a particle in one dimensional box of length L can be found 0.4 L to 0.8 L for the ground state. Given $\psi = \left(\frac{2}{L}\right)^{\frac{1}{2}} \sin\left(\frac{n\pi x}{L}\right)$.

15. A particle limited to the x-axis has the wave function $\psi = ax$ between $x = 0$ and $x = 1$, $\psi = 0$, elsewhere. Find the expectation value of the particle position.

16. The position and momentum of a 1.1 KcV electron are simultaneously determined. If its position is located within $1A^0$, what is the percentage of uncertainty in its momentum.

PART – C

III. Answer any **TEN** of the following. Each question carries **2** marks. **(10 × 2 = 20)**

17. (a) Write any two merits of integrated circuit technology.

(b) What are monolithic integrated circuits?

(c) What happens to the input and output impedance in a voltage series feedback?

(d) What is meant by open loop gain of an op-amp?

(e) Mention any two applications of a microcontroller.

(f) Why microprocessor is faster than microcontroller?

(g) What are the size of RAM and ROM memory of 8051?

(h) Name any two 16 bit register in the 8051.

(i) What are eigen values and eigen functions?

(j) Write the expressions for momentum and energy operators.

(k) Distinguish between a free particle and particle in a box.

(l) The concept of trajectory has no meaning in quantum mechanics. Explain.
