2016

ELECTRONICS

[Honours]

PAPER – VI

Full Marks : 100

Time : 4 hours

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

GROUP – A

Answer **three** questions, taking any **one** question from each Subgroup :

Subgroup – A (a)

1. (a) Perform following conversions : $2 + 2 + 2 + 2$

   (i) $(0.1011)_2$ to decimal

(*ii*) $(0 \cdot 3210)_{10}$ to binary

(*iii*) $(374 \cdot 37)_{10}$ to hexadecimal

(*iv*) $(675 \cdot 75)_{10}$ to an octal number.

(*b*) The sum and difference of two binary numbers are 1110 and 10 respectively. Find the two numbers. 2

2. (*a*) Establish the following identities of Boolean algebra : 3 + 3

   (*i*) $A\bar{B} + \bar{A} + AB = 1$

   (*ii*) $\overline{\overline{A + B}} + \overline{\overline{A} + \overline{B}} = A$

   (*b*) Draw the circuit diagram of JK flip-flop using NAND gates only. Obtain the truth table and explain it. 4

Subgroup — A (b)

3. (*a*) Define modulation. Why modulation is required in communication system ? 2 + 2

   (*b*) Show that an amplitude modulated wave can be represented by a carrier and two side frequencies for each modulation frequency. 6

4. (*a*) An AM broadcast transmitter radiates 10 kW of unmodulated carrier power and 12·5 kW of total power when the carrier is modulated by a sinusoidal message signal. What is the depth of modulation ? If another sinusoidal message signal modulates the carrier simultaneously to a depth of 60%, what will be the total radiated power ?   4

(*b*) Using block diagram, show the generation of narrowband PM and FM waves.   4

(*c*) What do you mean by over modulation ?   2

Subgroup — A (c)

5. (*a*) Explain with diagrams the basic oscillator circuit for generation of square wave using op-amp.   5

(*b*) Draw the block diagram of CRO and indicate its basic component.   5

6. (*a*) What is the difference between dual beam CRO and dual trace CRO.   5

(b) What do you mean by electrostatic and magnetic deflection ? Compare between them. 5

GROUP – B

Answer **five** questions, taking at least
one from each Subgroup :

Subgroup – B (a)

7. Minimize the following function and realize it using minimum numbers of gates : 8

   $f = \Sigma m\ (0, 1, 3, 4, 7, 8, 10, 14, 15)$

8. What is race-around condition ? How can it avoided ? 8

9. Convert JK flip-flop to T flip-flop and D flip-flop. 8

10. What are the basic logic blocks of a microprocessor ? Briefly mention this functions. 2 + 6

Subgroup – B (b)

11. (a) What are the differences between PM and FM waves ? 2

(b) How can a slope detector be employed to detect FM waves ? What is its disadvantages ?

$4 + 2$

12. Draw and explain how an FM wave ferm can be generated using a reactance modulator.   8

Subgroup — B (c)

13. Explain the basic working principle or a Q-meter.   8

14. What is oscilloscope probe compensation and how is it adjusted ? What effects are noted when the compensation is not correctly adjusted.   8

GROUP — C

Answer five questions, taking at least one from each Subgroup :

Subgroup — C (a)

15. Show that NOR is a universal gate.   4

16. Design a 2-input EX-OR gate with the help of minimum number of 2-input NAND gates.   4

17. How can you design a 4 to 1 multiplexer using basic gates.   4

Subgroup – C (b)

18. Draw a block diagram showing the basic elements of a PCM system.   4

19. State and explain the convolution theorem.   4

20. Find the Laplace Transform of $\exp(-\alpha t) \sin \omega t$, whose α and ω are real positive constants.   4

Subgroup – C (c)

21. Discuss the uses of a CRO.   4

22. Draw and explain R-2R ladder D/A converter.   4

23. Discuss the factors that causes errors during a measurement.   4