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(CBCS)

(4th Semester)

ELECTRONICS

FOURTH PAPER

(Pulse Switching Circuits)

Full Marks : 75

Time : 3 hours

INSTRUCTIONS TO CANDIDATES

(Please read the instructions carefully before you start writing your answers)

1. Questions should be attempted as per instructions.
2. Do not copy the Questions. Indicate the Section and Question No. clearly while attempting the answer.
3. For Multiple choice answer, candidate should indicate the **Question No., Sub. No., (if any) and the correct answer. For example :**

1. *Name the State capital of Mizoram.*

(a) *Lunglei*

(b) *Aizawl*

(c) *Champhai*

Candidate should provide answer as—Q. No. 1 : (b) *Aizawl*

[Candidate should **avoid** writing only (b)]

4. The figures in the margin indicate full marks for the questions.

(SECTION : A—OBJECTIVE)

(Marks : 10)

Choose the correct answer from the options provided :

1×10=10

1. The value of negative feedback fraction is always
 - (a) less than 1
 - (b) more than 1
 - (c) equal to 1
 - (d) equal to 0
2. The gain of an amplifier without feedback is 100 dB. If a negative feedback of 3 dB is applied, the gain of the amplifier will become
 - (a) 5 dB
 - (b) 300 dB
 - (c) 103 dB
 - (d) 97 dB
3. An oscillator employs _____ feedback.
 - (a) positive
 - (b) negative
 - (c) neither positive nor negative
 - (d) Data insufficient
4. Which of the following oscillators cannot be used in low frequency oscillations?
 - (a) Wien bridge oscillator
 - (b) R-C phase-shift oscillator
 - (c) Colpitts oscillator
 - (d) R-C oscillator
5. Which among the following does not belong to the category of L-C oscillators?
 - (a) Hartley oscillator
 - (b) Colpitts oscillator
 - (c) Clapp oscillator
 - (d) Wien bridge oscillator

- 6.** Which type of oscillators is most stable and used in timing elements?
- (a) *R-C* oscillator
 - (b) *L-C* oscillator
 - (c) Crystal oscillator
 - (d) Wien bridge oscillator
- 7.** The number of energy storing element(s) in monostable multivibrator is
- (a) two
 - (b) one
 - (c) three
 - (d) No element
- 8.** Astable multivibrator has
- (a) one stable state
 - (b) two stable states
 - (c) no stable state
 - (d) three stable states
- 9.** The binary system uses powers of _____ for positional values.
- (a) 2
 - (b) 10
 - (c) 8
 - (d) 16
- 10.** Boolean algebra is essentially based on
- (a) symbols
 - (b) logic
 - (c) truth tables
 - (d) numbers

(SECTION : B—SHORT ANSWER)

(Marks : 15)

Answer the following questions :

3×5=15

1. What is 'feedback factor' of a feedback amplifier? Define sensitivity and desensitivity of gain in feedback amplifiers.

OR

State Barkhausen criterion for sustained oscillation. What will happen to the oscillation if the magnitude of the loop gain is greater than unity?

2. Write down the general applications of oscillators.

OR

Why does an L - C tank circuit not produce sustained oscillations? How can this be overcome?

3. What is the necessary condition for a Wien bridge oscillator circuit to have sustained oscillations?

OR

What are the advantages and disadvantages of R - C phase-shift oscillators?

4. What are the uses of multivibrators?

OR

Show that the switching time (time period) of an astable multivibrator is 1.38 times the product of R and C .

5. Multiply $(1111)_2$ by $(0111)_2$ using binary multiplication method.

OR

Write the symbol and truth table of NAND gate.

(SECTION : C—DESCRIPTIVE)

(Marks : 50)

Answer the following questions :

10×5=50

1. Explain in detail the different types of feedback topologies. What are the advantages of introducing negative feedback? 6+4=10

OR

2. State the Nyquist criterion to maintain the stability of negative feedback amplifier. Justify that negative feedback amplifier increases bandwidth. 5+5=10

3. What do you understand by damped and undamped electrical oscillations? Illustrate your answer with example. How will you get undamped oscillation from a tank circuit? 4+2+4=10

OR

4. With a neat diagram, explain the action of Hartley and Colpitts oscillators. 5+5=10

5. What is piezoelectric effect? Explain series and parallel resonant frequencies from crystal oscillator equivalent circuit. 2+4+4=10

OR

6. Write short notes on the following : 3+3+4=10

(a) R-C oscillator

(b) Wien bridge oscillator

(c) Crystal oscillator

7. (a) Explain the construction and operation of bistable multivibrator. 6

(b) Draw the circuit diagram of monostable multivibrator. Also write its uses. 2+2=4

OR

8. (a) With a neat sketch, explain the quiescent condition, circuit action, negative half-cycle of the input voltage and output pulse width of Schmitt trigger. 6
- (b) Why is Schmitt trigger called 'emitter-coupled binary'? Write the differences between multivibrator and Schmitt trigger. 2+2=4
9. (a) What are the three basic logic gates? With the help of logic circuit diagram, explain the operation and truth table of OR gate. 1+4=5
- (b) Express the following binary numbers into their equivalent decimal numbers : 3
- (i) $(101.11)_2$
- (ii) $(110.01)_2$
- (c) Using 2's complemental method, subtract $(1010)_2$ from $(1101)_2$. 2

OR

10. (a) With logic circuit, explain the construction and truth table for half-adder. 4
- (b) What would be the output signals if two signals A $(1010110)_2$ and B $(110101)_2$ are applied to the inputs of (i) OR gate and (ii) NAND gate? 2+2=4
- (c) Divide $(1100010)_2$ by $(111)_2$ using binary division method. 2

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