MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : CS-301

ANALOG AND DIGITAL ELECTRONICS

Time Allotted: 3 Hours | *Full Marks*: 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternative for *any ten* of the following: 1×10=10

(i) Cross-over distortion occurs in

(a) Class A amplifier (b) Class AS amplifier

(c) Class C amplifier (d) Push pull amplifier

(ii) Which of the following mode of BJT can be used as an amplifier?

(a) CB (b) CC

(c) CE (d) None of these

(iii) Simplify A′B + A + BC

(a) A + BC (b) A + B

(c) A′+ BC (d) None of these

(iv) An example of weighted code is

(a) 2421 (b) GRAY

(c) XS3 (d) All of these

(v) How many 1's are present ion the binary representation of decimal number $(3 \times 521 + 7 \times 64 + 5 \times 8 + 3) = ?$

(a) 8
(b) 9
(c) 10
(d) 11

(vi) Master-slave configuration is used in flip-flop to

(a) increase its clocking rate
(b) reduce power dissipation
(c) eliminate race around condition
(d) improve its reliability

(vii) A pure sine wave output is possible with

(a) Hartley oscillators
(b) Wien-bridge oscillators
(c) RC phase shift oscillators
(d) Colpitt oscillators

(viii) To avoid the thermal runway, q point should be such that it satisfied

(a) $V_{ce} = V_{cc}/2$
(b) $V_{ce} < V_{cc}/2$
(c) $V_{ce} >= V_{cc}/2$
(d) $V_{ce} < V_{cc}/4$

(ix) The output pulse width for a monostable multivibrator using IC 555 where external resistance and capacitance are 20 kO and 0·1flF is

(a) 2·1 s
(b) 2 ms
(c) 2·5 ms
(d) 2·2 us

(x) Multivibrators

(a) generate square wave
(b) convert sine to square wave
(c) convert triangular to sine wave
(d) convert triangular to square wave

(xi) A 32:1 MUX can be designed using

(a) two 16:1 MUXs and one two input OR gate
(b) two 16:1 MUXs and one two input AND gate
(c) two 16:1 MUXs and 2 two input OR gate
(d) two 16:1 MUXs only

Group – B
(Short Answer Type Questions)
Answer *any three* of the following. 5×3=15

2. What do you mean by race around condition? How this problem is solved by using master-slave flip-flop? 3+2=5

3. (a) Difference between sequential circuits and combinational circuits.

(b) What is triggering? How many types of triggering are there in sequential circuits? 2+2+1=5

4. Design NAND and NOR logic gate using CMOS technology.

5. Obtain the minimal POS expression of the following function and implement the same using only NOR gates.
$F(A, B, C, D) = \Sigma m(1, 4, 7, 8, 9, 11) + \Sigma d(0, 3, 5)$

6. Draw and explain Schmitt trigger circuit using 555 timer. 2+3=5

Group – C
(Long Answer Type Questions)
Answer *any three* of the following. 15×3=45

7. (a) Design a logic diagram, using logic gates, for addition/subtraction circuit, using a control variable P such that this operates as full adder when $P = 0$, and full subtractor for $P = 1$.

(b) Implement the following function using 4 : 1 MUX only : $F = \Sigma m$ (0, 2, 3, 6, 8, 9, 12, 14). 8+7=15

8. (a) What are the possible classifications of power amplifiers depending on the position of their Operating point?

(b) For a Transformer coupled class A amplifiers draw the AC load line. Hence calculate the maximum value of efficiency.

(c) For class B push-pull amplifier calculate the maximum value of efficiency. 2+(3+3)+7=15

9. (a) Draw and explain the 4 bit bi-directional Shift Register using mode control (M), when M is logic zero then left shift an right shift for M is logic one.

(b) What are the facilities available in universal shift register? How a 4-bit universal shift register can be realized using multiplexers and flip-flops? 6+2+7=15

10. For a synchronous counter with sequence: $2 \rightarrow 6 \rightarrow 5 \rightarrow 3 \rightarrow 1 \rightarrow 0 \rightarrow 2$

(a) Give present state/next state table.

(b) Write state transition table using D flip-flops.

(c) Simplify and realize the circuit. Draw the state diagram.

(d) Justify where the design counter will go in lockout condition or not.

(e) What should be the corrective design process to avoid the lockout condition?

11. Write short notes on *any three* of the following: 5×3=15

(a) Grey code

(b) Johnson counter

(c) Even parity generator and checker

(d) Phase shift oscillator

(e) Current shunt feedback
