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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 alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) Cross-over distortion occurs in
      a) Class A amplifier
      b) Class AB amplifier
      c) Class C amplifier
      d) Push pull amplifier.

   ii) The minimum distortion during amplification is obtained in
      a) Class A amplifier
      b) Class B amplifier
      c) Class C amplifier
      d) Class AB amplifier.

iii) A class C amplifier conducts for

a) π b) 2π

c) $< \pi$ d) $0 - \pi$.

iv) Synchronous counters eliminate the delay problems encountered with asynchronous (ripple) counters because the

a) input clock pulses are applied only to the first and last stages

b) input clock pulses are applied simultaneously to each stage

c) input clock pulses are applied only to the last stage

d) input clock pulses are not used to activate any of the counter stages.

v) Which one is used for parallel to serial conversion ?

a) MUX

b) DEMUX

c) ENCODER

d) DECODER.

vi) A comparison between ring and Johnson counters indicates that

a) a Johnson counter has an inverted feedback path

b) a Johnson counter has more flip-flops but less decoding circuitry

c) a ring counter has an inverted feedback path

d) a ring counter has fewer flip-flops but requires more decoding circuitry.

vii) Gray code of $(110101)_2$ is

a) 101111 b) 100110

c) 111010 d) 101011.

viii) A pure sine wave output is possible with

a) Hartley oscillators

b) Wien bridge oscillators

c) RC phase shift oscillators

d) Colpitt oscillators.

ix) The Bark hausen criterion for sustained oscillation is

a) $A\beta = 1$ b) $|A\beta| \geq 1$

c) $|A\beta| < 1$ d) NOT.

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) The output pulse width for a monostable multivibrator using IC 555 where external resistance and capacitance are 20 kΩ and 0.1 μF is

a) 2.1 s b) 2 ms

c) 2.5 ms d) 2.2 μs.

xii) In order to generate a square wave from a sinusoidal input signal one can use

a) monostable multivibrators

b) clipper and amplifiers

c) Schmitt trigger circuit

d) both (b) and (c).

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What do you mean by race around condition ? How this problem is solved by using master-slave flip-flop ? 3 + 2
3. Draw the timing diagram of a 4-bit ring counter.
4. Why gray code is called reflected code ?
5. A Wien bridge oscillator has a frequency of 1000 Hz and a capacitance of 100 pF. Find the resistance. If the amplifier gain is 10, obtain the ratio of the resistances in the other arms.
6. Draw and explain Schmitt trigger circuit using 555 timer. 2 + 3

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) What are the advantages and disadvantages of negative feedback ?

   b) A negative feedback amplifier has the following parameters :

   Open loop Gain A = 200; feedback ratio β = 0.02 and input voltage Vi = 5mV

   Compute the following :

   i) Gain with feedback

   ii) Output voltage

   iii) Feedback factor

   iv) Feedback voltage. 5 + 10

8. a) What do you mean by power amplifier ? How different types of classification are made in power amplifier ? Explain the operation of Class B push-pull amplifier ?

   b) What is crossover distortion ? 2 + 3 + 7 + 3

9. a) Determine minterm and maxterm. What is canonical form ?

   b) Minimize the following expression using k-map $f(A, B, C, D) = \Sigma m(3, 4, 5, 6, 7, 12, 13, 14, 15)$.

   c) Draw the clocked master-save J-K flip flop using NAND gate and explain its operation with truth table. 4 + 6 + 5

10. a) Explain the operation of a D/A converter.

    b) What is advantage of R-2R type D/A converter over other type of D/A converter ?

    c) Draw circuit of a full adder. How you obtain a full Subtractor using two half Subtractor ? 6 + 2 + 7

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

a) Grey code

b) Johnson counter

c) Encoder

d) Phase shift oscillator

e) Current shunt feedback.