KATHMANDU UNIVERSITY
End Semester Examination [C]
December, 2024

Marks Scored:

Level : B.E.
Year : III

Course : EEEG 320
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : 19 DEC 2024

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Choose and encircle in the most appropriate option from each set of choices

1. The result "X + XY = X" follows which of these laws?
   a. Consensus law b. Distributive law c. Duality law d. Absorption law

2. Which of these pins will allow to activate and deactivate a multiplexer?
   a. Enable pin b. Selection pin c. Logic pin d. Preset pin

3. What are the basic gates in MOS logic family?
   a. NAND and NOR b. AND and OR c. NAND and OR d. AND and NOR

4. In a J-K flip-flop, if J=K the resulting flip-flop is referred to as _____
   a. D flip-flop b. S-R flip-flop c. T flip-flop d. S-K flip-flop

5. Which characteristic of IC in Digital Circuits represents a function of the switching time of a particular transistor?
   a. Fan – out b. Fan – in c. Power dissipation d. Propagation delay

6. The minimum input voltage recognized as HIGH by a TTL gate is _____.
   c. 2.0 V b. 2.4 V 0.8 V d. 5.0 V

7. Which of the following is the fastest means of memory access for CPU?
   a. Registers b. Cache c. Main memory d. Virtual Memory

8. Dynamic RAM employs _____
   a. Capacitor or MOSFET b. FET or JFET
   c. Capacitor or BJT d. BJT or MOS

9. Which of the following is not defined by the entity?
   a. Direction of any signal b. Names of signal
   c. Different ports d. Behavior of the signals

10. Which of the following is used at the end of a statement?
    a. ; (Semicolon) b. — (double hyphen)
    c. _ (underscore) d. No sign is used at the end of statement

11. Which of the following is not a reserved word in VHDL?
    a. Constant b. Identifier c. Variable d. Signal

12. LRU in Cache Memory stands for _____
    a. Low Rate Usage
    b. Least Rate Usage
    c. Least Recently Used
    d. Low Required Usage

13. Naming the states is done in
    a. transition table
    b. stable state
    c. flow table
    d. excitation table

14. The inputs in the PLD is given through _____
    a. NAND gates b. OR gates c. NOR gates d. AND gates

15. Which of the following is related to a characteristic of FPGA?
    a. PLD b. EPROM c. EEPROM d. RAM

16. Among the VHDL features, which language statements are executed at the same time in parallel flow?
    a. Concurrent b. Sequential c. Net-list d. Test-bench

17. What is the function of the Configurable Logic Block (CLB) in an FPGA?
    a. To manage clock signals
    b. To handle i/o operations
    c. To perform logic functions based on the programming
    d. To store configuration data

18. Timing analysis is more efficient with synchronous systems whose maximum operating frequency is evaluated by the _____path delay between consecutive flip-flops.
    a. shortest b. average c. longest d. unpredictable

19. The digital circuit should be tested at
    a. design level b. chip level c. transistor level d. switch level

20. Replication in digital system design improves
    a. timing b. area c. power d. testing

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Level : B.E.
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19 DEC 2024

Course : EEEG 320
Semester : II
F. M. : 40

SECTION "B"
[4 Q. × 10 = 40 marks]

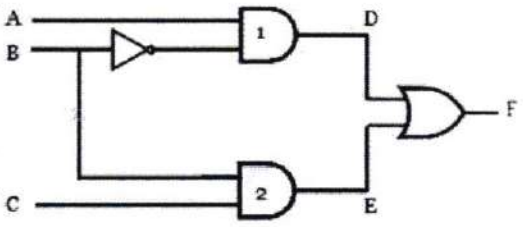
Attempt *ANY FOUR* questions. *Symbols have their usual meanings. Urgent appropriate assumptions are permissible. Marks are indicated inside brackets.*

1.

a. Design a circuit that has a 3-bit binary input and a single output (Z) specified as follows: [3]
   Z = 0, when the input is less than 5
   Z = 1, otherwise

b. Write down the characteristics of CMOS logic families. Explain analytically the behavior of a CMOS based NOR gate with its diagram. [2+2]

c. Design a hazard free version of the circuit given below. [3]



Logic circuit
$F = A\bar{B} + BC$

2.

a. Discuss cycles and hazards in digital circuits with examples. [1+3]

b. List different strategies for optimizing area while designing digital circuit. Explain any one of them. [1+3]

c. Discuss different VHDL modelling techniques with examples. [2]

3.

a. Write a VHDL code and test bench for a 4×1 multiplexer. [2+3]

b. Discuss different types of gate array based ASICs in brief. [3]

c. List cache mapping techniques and explain one of them in brief. [2]

4.

a. List and Describe FPGA design flow. [4]

b. Show how a PAL is programmed for the following 3-variable logic function. [4]
   Y= AB'C' + ABC+A'B'+AC

c. Differentiate between fundamental and pulse mode asynchronous sequential circuits. [2]

5.

a. Discuss the concept of look up tables in the FPGA design with an example. [3]

b. An asynchronous sequential circuit is described by the following excitation and output and output function,
   $Y = X_1X_2 + (X_1X_2)Y$
   $Z = Y$
   i. Draw the logic diagram of the circuit.
   ii. Derive the transition table and output map.
   iii. Describe the behavior of the circuit [4]

c. Explain the basic testing principle of digital circuit. List different types of real defects in chips. [2+1]

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Marks Scored:

Level : B.Tech.
Year : III

Course : BIOT 302
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date : 18 DEC 2024

SECTION "A"

[20 Q. × 1 = 20 marks]

Choose and encircle in the most appropriate option from each set of choices

1. Which of the following is **NOT** a biological role of CSSR
   a. Insertion of phage genome into the bacterial genome
   b. Alternative cleaving of exons of the eukaryotic genes
   c. Alteration of gene expression
   d. Maintaining structural integrity of circular DNA molecules

2. Which of the following statements is **TRUE**?
   a. IS4 family of transposon includes bacterial Tn10 and Tn5
   b. IS4 family of transposon includes eukaryotic Tn10 only
   c. IS4 family of transposon includes prokaryotic Tn10 only
   d. IS4 family of transposon includes eukaryotic Tn10 and Tn5

3. What is alpha CTD?
   a. It is the C terminal of RNA Pol II of eukaryotes
   b. It is the C terminal of RNA polymerase of E. coli
   c. It is the C terminal of sigma subunit of E. coli
   d. It is the C terminal domain of the transcription factor EF-G

4. What do torpedo and allosteric models both describe:
   a. Initiation of transcription in eukaryotes
   b. Elongation of transcription in eukaryotes
   c. Termination of transcription in eukaryotes
   d. Termination and elongation of transcription in prokaryotes

5. What about introns is **TRUE**?
   a. Introns sometimes have protein-encoding sequences embedded among them.
   b. Introns when they splice out always form lariat.
   c. Introns are found in many bacteria and archaea.
   d. Generally introns are longer than exons.

6. Transport of mRNA
   a. Is a passive process, any mRNA can be transported out of the nucleus
   b. Is a passive process, only some mRNA can be transported out of the nucleus
   c. Is an active process, any mRNA can be transported out of the nucleus
   d. Is and active process, only some mRNA can be transported out of the nucleus

7. Group I and Group II introns
   a. Can splice all on their own
   b. Require certain other proteins to splice
   c. Require certain other RNA to splice
   d. Require certain other protein and RNA to splice

8. Which of the following is **TRUE** about dihydrouridine:
   a. It contains a nucleoside where uracil is attached to ribose
   b. It contains a nucleoside where non conventional position of the uracil links to ribose
   c. It contains modified uracil linked to ribose
   d. It contains nucleoside where uracil is attached to deoxyribose

9. Ribosome
   a. In both prokaryotes and eukaryotes contains only one subunit
   b. Has active site in RNA in both eukaryotes and prokaryotes
   c. Contains RNA only in one subunit and protein only in another subunit
   d. Contains two subunits which are exact replica of each other

10. EF-Tu
   a. Is an elongation factor in transcription elongation
   b. Exactly mimics a tRNA
   c. Escorts amino acyl tRNA to the A site of the ribosome
   d. Contains a GGQ motif

11. What is the advantage of ribosome profiling over polysome profiling
   a. Actively translated mRNA can be discovered
   b. The exact site that occupy P and A sites in the ribosome can be identified
   c. Cycloheximide treatment is less aggressive
   d. Sequencing gives the exact mRNA that is translated

12. What about the genetic code is **FALSE**?
   a. There are three stop codons.
   b. There is only one amino acid with one codon.
   c. Serine is encoded by six codons.
   d. Phenylalanine is encoded by 2 codons.

13. LacZ gene encodes for beta galactoside. What does this enzyme used for?
   a. Cleaving maltose into two molecules of glucose
   b. Removing toxic substance accumulated in the E coli cell
   c. Fragments are used for alpha complementation experiment
   d. Conversion of lactose to arbabinose, which acts as an inducer

14. Which of the following is **TRUE**?
   a. MerR promoter has modified -10 and -35 consensus sequence.
   b. MerT gene has promoter that can be accommodated by MerR
   c. MerR gene has promoter that can be accommodated by MerT
   d. Ntrc promoter has modified -10 and -35 consensus sequence

15. How does multiplicities of infection dictate lysogeny or lysis
    a. It does that through direct regulation of CII gene
    b. It does that through direct regulation of Cro gene
    c. It does that through direct regulation of lamda gene
    d. It does that through direct regulation of CIII gene

16. Lactose tolerance has developed in certain populations of humans. That means certain humans can digest lactose using lactase enzyme late into adulthood. In most mammals lactose enzyme is not expressed except for early childhood when the animal is drinking mother's milk. What mutation could most likely lead to development of lactose tolerance in certain human populations?
    a. Nonsense mutation in the coding sequence of the lactase gene
    b. Missense mutation in the coding sequence of the lactase gene
    c. Mutation in the enhancer of lactase gene
    d. Mutation in the region encoding for mediators of transcription

17. What are insulators?
    a. They insulate charge between activators
    b. They insulate activity of an enhancer on a promoter
    c. They insulate activity of two activators
    d. They insulate charge from an enhancer to a promoter

18. Which of the following RNA acts in cis?
    a. siRNA that regulate destruction of mRNA through slicer activity
    b. sRNA in bacteria that triggers destruction of mRNA
    c. miRNA in eukaryotes that regulate several gene products
    d. HOTAIR lncRNA that regulates HoxD gene cluster

19. Which of the following is **NOT** carried out by miRNA?
    a. Chromatin remodeling in the nucleus
    b. Translational inhibition that is not fully understood
    c. Degradation of mRNA that pairs with miRNA
    d. Editing of mRNA produced by a given gene

20. Which of the following is an example of oscillating circuit
    a. cI and cro reciprocally inhibiting each other
    b. SinR and SlrR inhibiting each other in double negative loop
    c. Repressilator inhibiting three genes sequentially
    d. GcrA and CtrA protein cycling during Caulobacter crescentus cell cycle