Bangladesh Army International University of Science and Technology (BAIUST), Comilla Cantonment.

Department of Computer Science & Engineering (CSE)
Level 2, Term II
Term Final Examination, Fall 2020
Course Code: CSE-211
Course Title: Digital Electronic and Pulse Techniques

Notes:

1. *Answer **Four (04)** questions out of **Six (06)** questions.*
2. ***Question one (1) is mandatory.***
3. *Figures in the right margin indicate the full marks of each question.*

Time: 1.30 Hrs.
Full Marks: 40

True/False and Fill in the blank **1x10=10**

1. a. Pentavalent impurities are referred to as ----------impurities.

b. Identify different The depletion region of a diode acts as an ----------.

c. Physical model of a Boolean function is called ----------.

d. Astable multivibrator has -------- stable state.

e. The maximum possible voltage gain from a given *OP-amp* is ----------.

f. Impedance of a capacitor is represented by----------.

g. The input impedance of an *OP-amp* is relatively high with negative feedback (True/False).

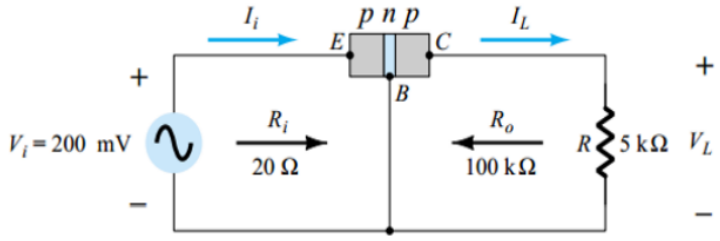
h. The buffer amplifier is a special case of inverting amplifier (True/False).

i. Half wave rectifier in power supply kit is a typical example of clipper (True/False).

j. PAL has only programmable *AND* planes and *OR* plane is fixed (True/False).

2. a) What is current amplification factor? Draw the circuit diagram of *PNP* transistor for *CB* and *CE* configurations. 1+2

b) For the following circuit, determine the value of V_L. 3



c) What do you mean by *DTL* and *TTL*. 4
Find the minimum Base current (I_B) required to turn the transistor saturated for β=200 and a load that requires 200 *mA* of current when the input voltage is increased to 5.0 V. Also calculate the new value of R_B.

3. a) Write down the application of *TTL*. Briefly explain the *TTL NAND* and *TTL NOR* gate. 1+3

b) What do you mean by *Pull-up* and *Pull-down* resistor? 2

c) Define *MOS* and *CMOS*. Briefly describe the construction of *CMOS* technology. 4

4. a) Draw the logic diagram of Programmable Array Logic (*PAL*). 2

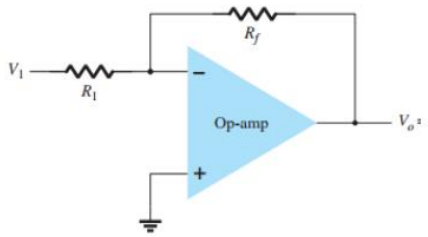
b) Mention the main difference between Programmable Logic Array (*PLA*) and Programmable Array Logic (*PAL*). 1

c) A five-bit *DAC* has a current output. For a digital input of 10100_2 , an output current of 10 mA is produced. What will the output current for digital input 01001_2 . 3

d) Define full-scale output. What is the largest value of output voltage from an eight-bit DAC that produces 2V for a digital input of 1101101_2. 1+3

5. a) Draw the circuit diagram of Inverter and Non-inverter Schmit trigger. 2

b) For the following Figure, determine the output voltage V_0 for an input of v_1=2v, R_1=100kΩ, and R_f=500kΩ, 3



c) How does Clamper circuit work? Write short notes on series negative clipper and negative clamper with positive reference voltage. 1+4

6. a) What is the difference between linear and non-linear waveshaping circuits? 2

b) Define filter. Write down the impedance and reactance of a capacitor. 2

c) Find out the voltage gain of high-pass *RC* circuit. 4

d) What is the difference between *AMV, MMV* and *BMV* . 2

Bangladesh Army International University of Science and Technology (BAIUST), Comilla Cantonment.

Department of Computer Science & Engineering (CSE)

Level 2, Term II

Term Final Examination, Fall 2020

Course Code: CSE-213

Course Title: Computer Architecture

Part - A Note

Answer any four of the five questions fromthis part. All questions have five marks.

1.Why is Moore's law considered important in computer architecture?
2.Why is SPEC and Benchmark used? Describe the desirable characteristics of a benchmark program.
3. Convert the following code into MIPS assembly code:

```
if (a[10] == 12)
{
a[10] = a[10] + 17;
}
else
{
a[15] = a[10]
}
```

The base address of array a is assigned to $s3 register.
4.Briefly discuss about Register Addressing and PC-Relative Addressing.
5. Describe the process of floating point addition.

Part - B Note

AnswerAny Four of the five questions fromthis part. All questions have five marks.

6.Describe the Instruction Fetch and Arithmetic Logical Operations steps of a simple datapath.
7. What is Control Hazard? Describe the solutions to avoid control hazard.
8. What is the function of Cache Memory? How are cache misses for instructions handled?
9. Describe the uses and differences between RAM and ROM.
10. What is RISC and CISC? Which one is more advantageous and why?

EXAMINATION CONFIDENTIAL

বাংলাদেশ আর্মি ইন্টারন্যাশনাল ইউনিভার্সিটি অব সায়েন্স এন্ড টেকনোলজি (বিএআইইউএসটি), কুমিল্লা সেনানিবাস
Bangladesh Army International University of Science and Technology (BAIUST), Comilla Cantonment

Department of Computer Science and Engineering
Level-2 Term-II

Term Final Examination, Fall 2020
Course Code: CSE – 215
Course Title: Algorithm

Notes: **Time: 1.50 hrs.**
Full Marks: 70

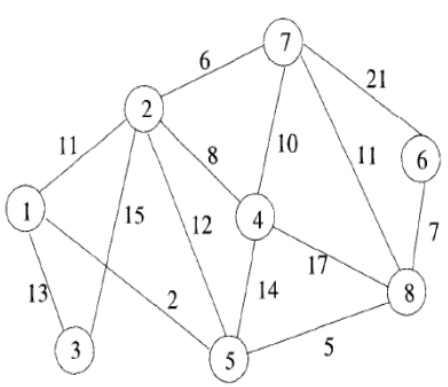
a. Figure on the right of each question indicate marks for respective question.
b. All questions need to be answered.

1. a. Define Algorithm and write down the set of rules that an algorithm should follow. 5

   b. Illustrate the operation of merge sort on the array A = {3, 41, 52, 26, 38, 57, 9, 49}. 5

2. a. Determine an LCS of {0; 0; 1; 0; 1; 0; 1} and { 1; 0; 1; 1; 0; 1; 1; 0} and also write down the pseudo code of this procedure. 5

   b. Compute a minimum cost spanning tree for the graph using(a) Prim's algorithm and (b) Kruskal's algorithm 10

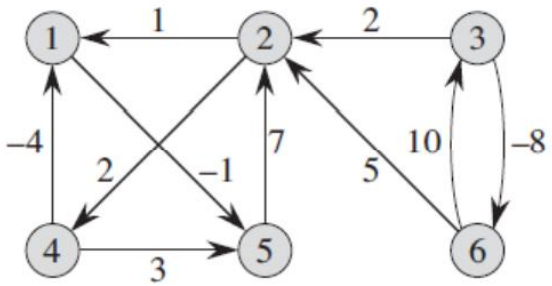


3. a. Give a simple example of a directed graph with negative-weight edges for which Dijkstra's algorithm produces incorrect answers. Why doesn't the proof of Theorem Correctness of Dijkstra's algorithm go through when negative-weight edges are allowed? 5

   b. Develop an algorithm that is used to solve the 0/1 knapsack problem. Also compare the run time and storage requirement of this algorithm 10

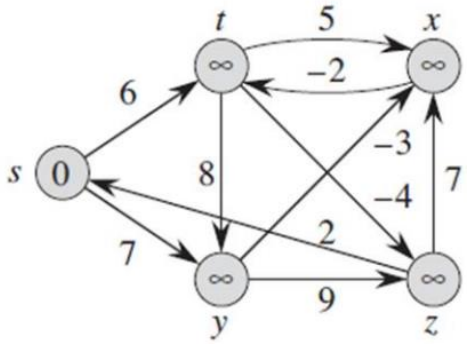
4. a. Prove that the fractional knapsack problem has the greedy-choice property. 5

b. Run the Floyd-Warshall algorithm on the weighted, directed graph given below. Show the matrix $D^{(k)}$ that results for each iteration of the outer loop. 10



5. a. We are given a directed graph G=(V,E) on which each edge (u,v)€ E has an associated value r (u,v) which is a real number in the range 0<r(u,v)<1 that represents the reliability of a communication channel from vertex u to vertex v. We interpret r (u,v) as the probability that the channel from u to v will not fail, and we assume that these probabilities are independent. Give an efficient algorithm to find the most reliable path between two given vertices. 10

b. Run the Bellman-Ford algorithm on the directed following graph, using vertex z as the source. 5



BANGLADESH ARMY INTERNATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

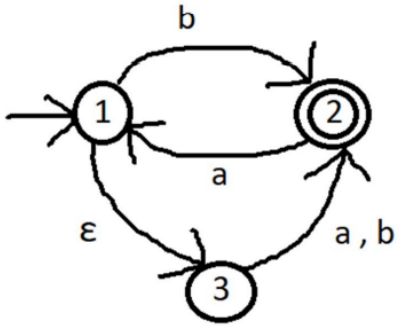
Department of Computer Science and Engineering (CSE)
Term Final Examination, Fall 2020
Course Code: CSE 217
Course Title: Theory of Computation

Notes:

a. Each question carries **05** Marks
b. There are **10** (ten) questions. Answer any **08** (eight)

Time : 1hr 20min

Full Marks: 40

1.	Construct a DFA over the $\sum$ = {a,b} a. which accepts the set of strings where every 'b' is followed by at least two 'a'. b. which accepts the set of strings with 'bbab' as a substring.	**5**
2.	Convert the following NFA into DFA:  	**5**
3.	Construct NFA from the following Regular Expressions: [Suppose, $\sum$ = {a,b}] a. $(ab)^*a$ b. $a(ab)^*$	**5**
4.	Construct Regular Expression from the following languages: [Suppose, $\sum$ = {a,b}] a. $(ab)^*a$ b. $a(ab)^*$	**5**
4.	Construct Regular Expression from the following languages: [Suppose, $\sum$ = {a,b}] a. L(M) = {w | w ends with 'ab'} b. L(M) = {w | w starts and ends with different symbol} c. L(M) = {w | w contains the substring 'bbab'} d. L(M) = {w | w is a string of length at most 3} e. L(M) = {w | w has a length, |w| = 3 (mod 2) }	**5**

5.	What do you mean by Parse Tree? Consider the grammar $E \rightarrow E - E \mid id$ Show in particular that the string "$id - id - id$" has- a. Parse tree b. Leftmost derivation c. Rightmost derivation	**5**
6.	Construct CFG from the following languages: [Suppose, ∑ = {a,b}] a. L(M) = {w | w is a string of odd length} b. L(M) = {w | w ends with 'ab'} c. L(M) = {w | w is a string of length at most 3} d. L(M) = {w | w contains the substring 'baba'} e. L(M) = {w | w is a string of length at least 3}	**5**
7.	Construct a PDA which is equivalent to the following given CFG: S → 0SX | 1SY | ε X → 1 Y → 0 Test whether 1010 is accepted by the PDA.	**5**
8.	What are the components of PDA? Why is the power of TM more than that of LBA?	**5**
9.	Design a TM for the language $\{1^n 2^n \mid n \geq 0\}$.	**5**
10.	Design FA from the following Regular Expression: [Suppose, ∑ = {a,b}] $(aa)^*(a + b)^*b$	**5**

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Bangladesh Army International University of Science and Technology (BAIUST) Comilla

Department of Computer Science and Engineering
Level-2, Term-II

Term Final Examination, FALL2020
Course Code: MATH 247
Course Title: Mathematics-IV

Notes: **Set-1** **Time : 1 hr. 30 mins**
Full Marks : 40

a. Each question carries 5 marks.

PART-A

Answer any four (04) questions from this part.

1. If $\sinh z = 2$ and $\cosh z = 3$, then find the value of the followings:

   (i) $\sinh 2z$
   (ii) $\coth^2 z - \operatorname{cosech}^2 z$.

2. Show that the function $u = e^x \cos y$ is harmonic and find a function v such that $f(z) = u + iv$ is analytic.

3. Show that the function $f(z) = \frac{1}{z}$ satisfy the Cauchy Riemann equations.

4. Using the Cauchy's integral formula evaluate the value of $\int_c \frac{\sin 3z\, dz}{\left(z + \pi/2\right)}$ where C is the circle $|z| = 5$.

5. Expand the function $f(z) = \frac{1}{z(z-3)}$ in a Laurent series for the following regions-
   $(a)\ 0 < |z| < 3$ $(b)\ |z| > 3$

PART-B

Answer any four (04) questions from this part.

1. Evaluate $L^{-1}\left\{\frac{1}{s^2(s+1)^2}\right\}$ by using the convolution theorem.

2. Find $L\{f(t)\}$ if $f(t) = \begin{cases} (t-2)^3 & t > 1 \\ 0 & t < 1 \end{cases}$.

3. Solve the following differential equation using Laplace transform:
   $$Y''(t) - 4Y'(t) + 5Y(t) = 125t^2;\ Y(0) = Y'(0) = 0.$$

4. Show that, $L\left\{\int_0^t \frac{1 - e^{-u}}{u}\, du\right\} = \frac{1}{s}\ln\left(1 + \frac{1}{s}\right)$

5. Find the Laplace transformation of $5\sin 5t + 7e^{-2t} - 4\cosh t + t^4 + 8\sin 2t$.

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Department of Computer Science and Engineering
Level-2, Term-II

Term Final Examination, FALL2020
Course Code: MATH 247
Course Title: Mathematics-IV

Notes: **Set-2** **Time : 1 hr. 30 mins**
Full Marks : 40

a. Each question carries 5 marks.

PART-A

Answer any four (04) questions from this part.

1. Evaluate $\lim_{z\to -2i} \dfrac{(z+3)(z-1)}{(z+2)\left(z^2-2z+4\right)}$ using theorem on Limits.
2. Prove that the function, $u=3x^2y+2x^2-y^3-2y^2$ is harmonic. Find its conjugate harmonic function. Also find its harmonic conjugate v and express $u+iv$ as an analytic function of z
3. If $f(z)=\dfrac{x^3-3xy^2+i(y^3-3x^2y)}{x^2+y^2}$, then show that $f(z)$ is satisfied the Cauchy-Reimann equation at $z=0$.
4. Using the Cauchy's Integral Formula evaluate the value of $\int_c \dfrac{e^{3z}}{z+\pi i}\,dz$, where C is the circle $|z+1|=4$.
5. Expand the function $f(z)=\cos 2z$ in Taylor series at the point $z=0$.

PART-B

Answer any four (04) questions from this part.

1. Find the Laplace transformation of $2\cos 7t+8e^{-5t}-4\sinh t+t^6+8+4\cos 3t$.
2. If $L\{f(t)\}=\dfrac{e^{-\frac{1}{s}}}{s}$, show that $L\left\{e^{-t}F(3t)\right\}=\dfrac{e^{-\frac{3}{s+1}}}{s+1}$
3. Determined the Laplace transformation of $t^2\sin bt$..
4. Solve the following differential equation using Laplace transform:
   $Y''(t)+Y(t)=t\,;\ Y(0)=1, Y'(0)=-2$.
5. Evaluate $L^{-1}\left\{\dfrac{3}{s^2(s+2)}\right\}$ by using the convolution theorem.