University of Asia Pacific
Department of Computer Science & Engineering
MidTerm Examination Spring 2018
Program: B. Sc. Engineering (2nd Year/2nd Semester)

Course Title: Algorithms | Course No. CSE 207 | Credits: 3.00
Time: 1.00 Hour | Full Marks: 60

There are **Four** Questions. Answer any **Three**. All questions are of equal value. Figures in the right margin indicate marks.

1. a) Find out the time complexity for the following Algorithm with proper explanation: 10

```
for( i=1; i<=n; i++ )
    for( j=1; j*j<=n; j++ )
        for( k=1; k<=n; k=k*2 )
        {
            // Work
        }
```

b) Demonstrate the recursion tree for Merge Sort and show how the time complexity of merge sort is assumed as $\Theta(n \lg n)$. 10

2. Simulate binary search on the given set of numbers. Show each step. 20
2, 3, 5, 6, 7, 10, 14, 14, 14, 20, 23, 70

i) Search for the number "2".
ii) Search for the number "10".
iii) Search for the number "7".

3. a) Demonstrate how greedy method decides between the choice of local optimal versus global optimal. 10

b) Write a pseudo-code to implement a greedy solution to the Fractional Knapsack problem. 10

Problem Statement: A thief is robbing a store and can carry a maximal weight of W into his knapsack. There are n items available in the store and weight of i^{th} item is w_i and its profit is p_i. What items should the thief take?
In this context, the items should be selected in such a way that the thief will carry those items for which he will gain maximum profit. Hence, the objective of the thief is to maximize the profit.
Consider that the thief can pick fraction of any item.

4. Implement the LCS table for the following two strings: 20

String 1 = "ABCBDAB"

String 2 = "BDCABA"

Then show the path along which the longest common subsequence lies. Finally, print the LCS.

Note: While printing the LCS, if there are two options to go left or go up, you should go left.

University of Asia Pacific (UAP)

Department of Computer Science & Engineering

Mid Term Examination | Year: **2nd year 2nd semester** | Semester: **Spring, 2018**

Course no. **CSE 209** | Course title: **Digital Logic & System Design** | Credit: **4.0**

Full Marks: **60** | Time: **1 hr**

(There are Four Questions. Answer any Three)

1. a) Discuss the universality of NAND gate. 05

b) Draw the following Boolean function with only NAND gates.

$y = \overline{A}\,B + A\,\overline{B}\,\overline{C}$ 07

c) Implement the following function using K-map.

$F(A, B, C, D) = \Sigma(0, 1, 2, 3, 7, 8, 10, 12, 13, 14, 15)$ 08

2. a) Draw the internal circuit of clocked J-K flip flop and briefly describe its operation. 10

b) Draw the internal circuit of clocked D flip flop and write down the truth table of the flip flop. 06

c) Design D flip flop from J-K flip flop. 04

3. a) Draw the internal circuit of IC # 74293(Counter) and describe its operation. 06

b) Design MOD 60 counter using IC # 74293. 08

c) Design MOD 6 Johnson counter and describe its operation. 06

4. For each of the following statements, indicate the type(s) of counter being described: 20

(i) Each FF is clocked at the same time.

(ii) Each FF divides the frequency at its clock input by two(2).

(iii) The counter sequence is 111, 110, 101, 100, 011, 010, 001, 000.

(iv) The counter has ten (10) distinct states.

(v) The total delay is the sum of the individual FF's delay.

(vi) The counter can count in either direction.

(vii) The counter counts from 0 to 9.

(viii) The MOD number is always twice the number of FFs.

(ix) The total delay is the sum of one FF's delay and one AND gate's delay.

(x) The MOD number is always equal to the number of FFs.

University of Asia Pacific (UAP)

Department of Computer Science & Engineering

Mid-Semester Examination Spring-2018

Program: B. Sc. Engineering (2nd Year/2nd Semester)

Course Title: Database Systems Course Code: CSE 211 Credits: 3.00

Time: 1.00 Hour Full Marks: 60

There are **Four** Questions. Answer any **Three**. Figures in the right margin indicate marks.

1. Everyday client(s) with their elderly relative(s) visit consultant(s) in an elderly care. Consultant(s) may prescribe one or more injections to clients for their elderly relative(s). Client(s) may purchase those injections from the pharmacy located at the elderly care for their elderly relative(s). 20

   Details of Consultant (Co_ID, Co_Name, Co_Fee), Client (C_ID, C_Name, C_Contact) and Injection (I_ID, I_Name, I_Price) are required.

   Based on this scenario, draw the corresponding Entity-Relationship (E-R) diagram with other necessary entity sets, attributes and relationship sets. Assume that, elderly relative(s) records were not kept through any of the attributes in the table client for cross-reference.

2. a) Explain the responsibilities of several types of database users with figure. 10

   b) Write down the DDL command for the following database operations: 10

   i) Create a new relation Cafeteria with cafeID, cafeName, mealName, price as attributes having proper domain types.
   ii) Add a new column mealType to the relation Cafeteria with domain type variable character having maximum 15 characters.

3. a) What is the basic query structure? Give examples. 6

   b) Discuss the domain types in SQL. 6

   c) Show that, $r \cap s = r - (r - s)$ for two relations r and s. 8

4. The following relational schema form a part of a University database held in a relational DBMS: 20

   department(d_ID, d_name, floor)
   student (s_ID, s_name, year, semester)
   course (c_code, c_name, credits)
   registration (s_ID, d_ID, c_code)

   Write down the Relational Algebra operations for the following queries:

   a) Find the student names who have registered the course Database Systems.
   b) Show the ID and name of department located at the 7th floor.
   c) Find the course codes and names registered by the 2nd year 2nd semester students.
   d) List the department names which offer 4 credits courses.
   e) Find all the registered students' ID of CSE department.

University of Asia Pacific
Department of Basic Sciences & Humanities
Mid Semester Examination, Spring-2018
Program: B.Sc. Engineering (Computer Science)
2nd Year / 1st Semester

Course Title: Math III: Multivariable Calculus Course Code: MTH 201 Credit: 3.0

Time: 1 Hour Full Marks: 60

There are **Four** Questions. Answer any **Three**. All questions are of equal value. Figures in the right margin indicate marks.

1.(a) Describe the space curve defined by vector equation. **10**

$$r(t) = \langle cost,\ sint,\ t \rangle$$

Also find the equation of tangent line to the curve at the point $(0,\ 1,\ \frac{\pi}{2})$.

(b) The position vector of a particle is given by **10**

$$r(t) = t^2 i + 2tj + lntk$$

Find its velocity, acceleration and speed when $t = 1$.

2.(a) Find the limit **10**

$$\lim_{(x,y) \to (0,0)} \frac{xy}{x^2+y^2}$$

if it exists.

(b) Let **10**

$$f(x,y) = \begin{cases} \dfrac{xy(x^2-y^2)}{x^2+y^2} & if\ (x,y) \neq (0,0) \\ 0 & if\ (x,y) = (0,0) \end{cases}$$

Check the continuity of the function f at the point $(0,0)$.

3.(a) The voltage V in a simple electrical circuit is slowly decreasing as the battery wears out. The resistance R is slowly increasing as the resistor heats up. Use Ohm's Law $V = IR$, to find how the current I is changing at the moment when the resistance is 400Ω and changing at a rate of $0.03\Omega/s$, the current is 0.08A and the voltage is changing at a rate of $0.01V/s$. **10**

(b) If $f(x,y) = xe^y$, find the rate of change of f at the point $P(1,0)$ in the direction from P to $Q(5,3)$. In what direction does f have the maximum rate of change? What is this maximum rate of change? **10**

4.(a) Find the local maximum and minimum values and saddle points of the function **10**

$$f(x,y) = x^4 + y^4 - 4xy + 1.$$

(b) A rectangular box is to be made from $64m^3$ of cardboard. Find the dimensions of the box so that the volume of the box will be largest. **10**

University of Asia Pacific

Department of Basic Sciences & Humanities

Mid Semester Examination, Spring-2018

Program: B.Sc. Engineering (Computer Science)

2nd Year / 2nd Semester

Course Title: Math IV | Course Code: MTH 205 | Course credit:3.00

Time: 1 hour | Full Marks: 60

There are **Four** Questions. Answer any **Three**. All questions are of equal value. Figures in the right margin indicate marks.

1. (a) Find the differential equation for $y = c_1 e^{3x} - c_2 e^{5x}$ by eliminating c_1 & c_2. **8**

(b) Solve the initial value problem $\frac{dy}{dx} = \frac{xy^2 - \cos x \sin x}{y(1-x^2)}$, $y(0) = 3$. **12**

2. (a) Solve: $\frac{dy}{dx} = \frac{3x - 4y - 2}{3x - 4y - 3}$ by a suitable substitution. **12**

(b) Solve: $y_2 \cos^2 x = 1$. **8**

3. (a) Solve: $(1+x^2)\frac{dy}{dx} + y = e^{\tan^{-1} x}$ using an integrating factor. **8**

(b) Solve: $(D^2 + 2D + 1)y = 2x + x^2$. **12**

4. (a) Solve: $\frac{d^3y}{dx^3} - 7\frac{d^2y}{dx^2} + 16\frac{dy}{dx} - 12y = 0$. **8**

(b) Solve: $(D^2 - 5D + 6)y = \sin(3x + 2)$ **12**

University of Asia Pacific
Department of Computer Science & Engineering
Mid-Semester Examination Spring -2018
Program: B. Sc Engineering (2nd Year/2nd Semester)

Course Title: Principles of Economics Course No. ECN 201 Credit: 2.00
Time: 1.00 Hours. Full Marks: 60

There are **Four** Questions. Answer any **Three** All questions are of equal value/Figures in the right margin indicate marks.

1. (a) Define economics. 3
   (b) Mention the names of two subfields of economics. 1
   (c)Which subfield of economics is concerned with the overall performance of the economy? 1
   (e) Why does the demand curve shift? Draw a shift of demand curve. Briefly illustrate the curve. 7
   (f)

Supply Schedule for Cornflakes				
		(1) Price ($ per box) P		(2) Quantity Supplied (millions of boxes per year) Q
A		5		18
B		4		16
C		3		12
D		2		7
E		1		0

   Draw a supply curve with the above table. Briefly illustrate the curve. 8

2. Illustrate the calculation of elasticities with an example. 20

3. (a) Is the demand for beef price-inelastic or price-elastic? Why? 4
   (b) What is total revenue? 4
   (c) Who are the low elasticity airline customers? 1
   (d) Who are the high elasticity airline customers? 1
   (e) How airlines charge different prices for the same service? 6
   (f) If you are desperate about buying a new operating system immediately, what is your elasticity? How the seller will charge you? 2
   (g) "If you are not in a hurry for an upgrade of an operating system, you can search around for the best price." What is your elasticity? How the seller will charge you? 2

4. (a) What is production function? Write with an example. 9
   (b) "The extra output produced by one additional unit of one input while other inputs are held constant." What term is used for this extra output? 2
   (c) Why marginal product calculation is crucial for understanding? 2