Heaven's Light Is Our Guide

# RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
### 3rd Year Odd Semester Examination 2018

COURSE NO: CSE 3109 COURSE TITLE: Microprocessors and Assembly Language TIME: 3 HRS

FULL MARKS: 70

N.B. (i) Answer any SIX questions taking any THREE from each section.
(ii) Figures in the right margin indicate full marks.
(iii) Use separate answer script for each section.

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## SECTION : A

Q.1. (a) State any three features of Intel 8086 microprocessor. What is the main difference between 8086 and 8088 microprocessor?
(b) Draw the internal architecture of 8086 microprocessor.
(c) What is instruction pre-fetch? How 8086 microprocessor perform instruction pre-fetching?

Q.2. (a) What are the actions take place in the process of a PC start-up after powering it on?
(b) How does a CPU execute a machine instruction?
(c) Can instruction pre-fetching be cumbersome for faster program execution? Explain briefly.

Q.3. (a) What is the significance of using interrupt vector table? Explain with example.
(b) Explain the working principle of INTR, INTA and NMI pin of 8086 microprocessor.
(c) Suppose AX contains 8BCDH and BX contains -71ABH. What will happen when the following instructions are executed:
(i) NEG AX and (ii) SUB AX, BX.
What will be the new settings of CF, SF, ZF, PF and OF.

Q.4. (a) Write an assembly program to determine the smallest number among three decimal numbers.
(b) What is the difference between AND and TEST instruction? If Al contains -15, give the decimal value of AL after SAR Al, 1 is executed.
(c) Write an assembly language program to display a 5X5 grid of "*".

Q.5. (a) What is DMA? Why should we use DMA for faster data transfer instead of using program instructions? 3

(b) How can you reverse a bit pattern using shift and rotate instruction? Explain with example. 3

(c) Suppose that AX=135AH, BX=3739H, CX=6EABH and SP=100H. Give the contents of AX, BX, CX and SP after executing the following instructions: 6

```
PUSH AX
PUSH BX
XCHG AX, CX
POP CX
PUSH AX
POP BX
```

Q.6. (a) Suppose AL=8CH and CF=1. What will be the contents fo AL after executing each of the following instruction: 4

(i) SAR AL, CL; where CL=5

(ii) ROR AL, CL; where CL=20

(b) What happens to the contents of AX after executing the following instruction: 3

```
MOV AX, -1
CWD
```

(c) Write an assembly language program that demonstrates the use of based indexed addressing mode. Use necessary comments to clarify the codes. 5

Q.7. (a) Suppose the following string has been declared: 5

```
STRING1 DB "THIS IS A STRING"
STRING2 DB 11 DUP(?)
```

Write some code that will cause STRING1 to be copied into STRING2 with the blank characters removed.

(b) What is macro? What is the function of instruction pointer IP? 2

(c) Write instructions that will allow user to take a string of letters and digits and separate then in next line. 5

Sample output:

Input: Enter String: 123ABC4

Output: Digits: 1234

Letters: ABC

Q.8. (a) Describe the steps that an 8086 will take when it responds to an interrupt. 3

(b) What is the purpose of a co-processor? What is CPU acceleration? 3

(c) Consider a program having 60% simple instruction and remaining complex. For CISC simple and complex instruction takes 4 and 8 cycles respectively, but RISC takes 7 cycles for simple instructions, complex instructions are executed as 14 simple instructions. If cycle time is 75 ns, what is the ratio of time taken by CISC to RISC for 1000000 instructions? 6

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

3rd Year ODD Semester Examination 2018

COURSE NO: CSE 3107 COURSE TITLE: Applied Statistics & Queuing Theory

FULL MARKS: 72 TIME: 3 HRS

N.B. (i) Answer any SIX questions taking any THREE from each section.
(ii) Figures in the right margin indicate full marks.
(iii) Use separate answer script for each section.

## SECTION : A

Q.1. (a) How does Statistic work? What are the differences between Descriptive Statistics and Inferential Statistics? 4

(b) What is the relationship between Response variable and Explanatory variable? In the following case identify the both variables: 4
"Researchers gave different amounts of alcohol to mice and measured the change in the mouse's body temperature 15 minutes later"

(c) Why is sample important rather than population? When might you sample the entire population? 4

Q.2. (a) Suppose the marks of 30 students of a subject are as follows: 6

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 29 | 34 | 44 | 64 | 69 | 38 | 45 | 54 | 29 | 44 |
| 69 | 39 | 45 | 54 | 37 | 35 | 52 | 42 | 46 | 52 |
| 62 | 64 | 59 | 44 | 54 | 56 | 64 | 44 | 54 | 110 |

i) Find the five-number summary of data.
ii) Draw a box-and -whisker diagram
iii) Find the $90^{th}$ percentile.

(b) What is coefficient of correlation? If this coefficient is 0.8, what is its physical interpretation? 3

(c) What is Kurtosis? What does it measure? Describe shortly the measures of Kurtosis you are familiar with. 3

Q.3. (a) What is meant by variability? Why the range can be misleading? 3

(b) What are the meaning of the following terms of skewness: 3
i) Mean = Median = Mode
ii) Mean > Median > Mode
iii) Mean < Median < Mode.

(c) Calculate the variance and standard deviation of the following data for the marks obtained in a test by 88 students 6

| Marks(x) | $0 \le x < 10$ | $10 \le x < 20$ | $20 \le x < 30$ | $30 \le x < 40$ | $40 \le x < 50$ |
|---|---|---|---|---|---|
| Frequency(f) | 6 | 16 | 24 | 25 | 17 |

Q.4. (a) State Bayes Theorem and prove it 6

(b) The diameter of an electric cable, say X, is assumed to be a continuous random variable with probability density function 4

$$f(x) = 6x(1-x), \quad 0 \le x \le 1$$

i) Check that the above is a probability density function
ii) Determine b such that $P[X < b] = P[X > b]$

(c) Write the properties of a binomial experiment. 2

## SECTION : B

Q.5. (a) Let X equal the larger outcome when a pair of four-sided dice is rolled. The p.m.f of X is 4

$$f(x) = \frac{2x-1}{16}, \quad x = 1, 2, 3, 4$$

Find the mean, variance and standard deviation of X.

(b) Determine the Poisson distribution from the binomial distribution. 6

(c) Find the mean and variance of binomial distribution. 2

Q.6. (a) What is moment generating function? Find the moment generating function of a normal distribution. 5

(b) If the moment generating function of X is

$$M(t) = \frac{2}{5}e^{t} + \frac{1}{5}e^{2t} + \frac{2}{5}e^{3t}$$ 4

Find the mean and variance of X

(c) How do you recognize an exponential distribution? How is it related to Poisson distribution? 3

Q.7. (a) Describe the properties which a binomial experiment must satisfy. When binomial distribution is impractical? 4

(b) A boiler has four relief valves. The probability that each opens properly is 0.99. 4

i) Find the probability that at least one opens properly.

ii) Find the probability that all four open properly.

(c) Which type of queuing configuration is used in supermarket express lanes? Briefly describe its advantages. 4

Q.8. (a) *Is repay-shop for taxi company a Birth-Death process? Explain Briefly. Also give an example of pure Birth and pure Death process.* 3

(b) *The inter-arrival time is exponentially distributed with a mean of 10 minutes and the service time has the uniform distribution with a maximum of 9 minutes and a minimum of 7 minutes. Find the* 5

i) mean wait in the queue

ii) mean number in the queue

iii) mean wait in the system

iv) mean number in the system

v) Proportion of time the server is idle.

(c) What is the standard notation of queuing system? Describe it. What is simplified notation? 4

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RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
3rd Year Odd Semester Examination 2018
COURSE NO: CSE 3105 COURSE TITLE: Software Engineering
FULL MARKS: 72 TIME: 3 HRS

N.B. (i) Answer any **SIX** questions taking any **THREE** from each section.
(ii) Figures in the right margin indicate full marks.
(iii) Use separate answer script for each section.

## SECTION : A

Q.1. (a) What is software? Write down the characteristics of software. 03
(b) Briefly explain the generic phases of software engineering. 05
(c) Write short notes on the following terms: i) Business software, ii) Embedded software, iii) Web-based software and iv) AI software. 04

Q.2. (a) What are the key traits of an effective project manager? 04
(b) Distinguish between the following terms – i) Direct and indirect measurement and ii) internal failure cost and external failure cost. 02
(c) Suppose you along with four of your friends (all are SW engineer) get an opportunity to develop a web-based software for the banking system of Rupali Bank Ltd. RUET. To make a proposal for that project, you should consider the following abstracts: i) process model, ii) Budget, iii) Time-line and iv) Risk management. Now describe what will be your analysis on the above abstracts for that banking project. 6

Q.3. (a) "It is better to have proactive risk strategies than reactive risk strategies" – do you agree with this statement? Justify your answer. 03
(b) Consider the following information where the weighting factors of particular measurement is marked by underline 05

| Measurement parameter | Count | Weight factor | | |
|---|---|---|---|---|
| | | Simple | Average | Complex |
| Number of input | 25 | 5 | 8 | 10 |
| Number of output | 35 | 3 | 5 | 7 |
| Number of inquiries | 15 | 5 | 10 | 15 |
| Number of files | 12 | 5 | 10 | 12 |
| Number of external files | 08 | 4 | 8 | 10 |

And consider the factors with the following value

| Factor | Value |
|---|---|
| Backup and Recovery | 5 |
| Online data entry | 3 |
| Data Communication | 4 |
| Critical performance | 4 |
| Distributed processing | 3 |

Now evaluate the estimated FP of this project. If productivity is 40 FP/person-month, pages of documentation is 850 and number of defects is 30 then find out the time required to complete the project (in year), quality and documentation metrics of this project.
(c) Explain different types of software reliability matrix. 04

Q.4. (a) What is MOI model of leadership? 02
(b) Explain the $W^5HH$ principles of project plan. 04
(c) Suppose you have to design a web application. For this project you should consider the following information domain characteristics: 06

Number of simple user inputs: 32
Number of complex user enquiries: 24
Number of complex user outputs: 60
Number of average type files: 8
Number of simple external interfaces: 2

Now, from the above information domain draw the table of count tatal and find out its

value. If the summation of complexity adjustment value is 10, then also find out the function point.

## SECTION : B

Q.5. (a) Suppose you are developing a real time face recognition software. Now depict the risk components of this project with the impact of the risk drivers using a impact assessment table. 04

(b) Consider the following table. 05

| Task | Predecessor | Time(day) | a | b | m |
|---|---|---|---|---|---|
| A | - | 5 | 4 | 7 | 5 |
| B | - | 8 | 7 | 9 | 8 |
| C | - | 10 | 8 | 12 | 10 |
| D | A | 10 | 8 | 12 | 10 |
| E | A,B | 12 | 10 | 14 | 12 |
| F | B,C | 15 | 14 | 16 | 15 |
| G | D,E | 20 | 19 | 21 | 20 |
| H | E,F | 25 | 23 | 27 | 25 |
| I | G,H | 10 | 9 | 11 | 10 |

Now from the table- i) Draw the CPM network
ii) Calculate slack time associated with each task( if there any)
iii) Identify critical path and calculate its total estimated time using PERT method.

(c) What is UML? Discuss the general set of diagrams of UML 2? 03

Q.6. (a) What is quality of design and quality of conference? 02
(b) Can a program be correct and still not exhibit good quality? Explain. 03
(c) What is API? Explain the purpose of API with example. 03
(d) Sketch and explain the system engineering hierarchy. 04

Q.7. (a) Suppose, a linux operating system has an estimated size of 85kLOC. Considering effort of 8 person-month, use software equation to evaluate the time required to develop this project. 04

(b) What is debugging? Write down the advantage and disadvantage of different debugging approaches. 04

(c) Write down difference between i) Alpha testing and beta testing and ii) Top-down integration and bottom-up integration. 04

Q.8. (a) What is CASE? Briefly describe the CASE building block. 03

(b) Consider the code segment given below which computes the average of 100 or fewer numbers that lie between boundary values [ assume all variables are initialized]: 09

```
i = 1;
total.input = total.valid = 0;
sum = 0;
DO WHILE value[i]<>-999 AND total.input<100
 increment total.input by 1;
 IF value[i]>=minimum AND value[i]<=maximum
 THEN increment total.valid by 1;
      sum = sum + value[i];
 ELSE skip
ENDIF
increment i by 1;
ENDDO
IF total.valid>0
 THEN average = sum/total.valid;
 ELSE average = -999;
ENDIF
```

Now for the above code segment-
i) Draw a flow graph.
ii) Determine the cyclomatic complexity from (i)
iii) Determine a basis set of linearly independent paths from (i) and (ii)
iv) Prepare test cases that will check (iii).

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## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
### 3rd Year ODD Semester Examination 2018

COURSE NO: CSE 3103 COURSE TITLE: **Data Communication**

FULL MARKS: 72 TIME: **3 HRS**

N.B. (i) Answer any **SIX** questions taking any **THREE** from each section.
(ii) Figures in the right margin indicate full marks.
(iii) Use separate answer script for each section.

## SECTION : A

Q.1. (a) What is Jitter? Why is it considered as fundamental characteristics of data communication system? Explain with an example. 4

(b) You have arranges five devices using star topology. How many cable links are required? What's happened if a connection fails? 4

(c) Why standards are essential in data communication? Differentiate between "de facto" and "de jure" data communication standards. 4

Q.2. (a) Suppose a computer sends a frame to another computer on a bus topology LAN. The physical destination address of the frame is corrupted during the transmission. What happens to the frame? How can the sender be informed about the situation? 4

(b) A computer monitor has a resolution of 1300 by 1000 pixels. If each pixel uses 1024 colors. how many bits are needed to send the complete components of a screen? 4

(c) What is bit interval and what is its counterpart in an analog signal? A non-periodic composite signal has a bandwidth of 200KHz, with a middle frequency of 140KHz and peak amplitude of 20V. The two extreme frequencies have an amplitude of 0V. Draw the frequency domain of the signal. 4

Q.3. (a) List three different techniques in serial transmission and explain the differences. 4

(b) What is the Nyquist sampling rate for each of the following signals? 4
i) A low-pass signal with bandwidth of 300KHz?
ii) A band-pass signal with bandwidth of 300KHz if the lowest frequency is 100KHz?

(c) Describe the Pulse Amplitude Modulation (PAM) technique with an appropriate example. 4

Q.4. (a) Draw the graph of the 2B1Q scheme using each of the following data streams? 4
i) 1111111111111111
ii) 0000000000000000
iii) 0011001100110011
iv) 0101010101010101

(b) What does the Shannon capacity have to do with communication? We have a channel with 4KHz bandwidth. If we want to send data at 100Kbps, what is the minimum $SNR_{dB}$? What is SNR? 4

(c) We have sampled a low-pass signal with a bandwidth of 300KHz using 1024 levels of quantization 4
i) Calculate the bit rate of the digitized signal.
ii) Calculate the $SNR_{dB}$ for this signal
iii) Calculate the PCM bandwidth of this signal.

## SECTION : B

Q.5. (a) Is there any difference between multiplexing and spread spectrum? We have a digital medium with data rate of 10 Mbps. How many 64Kbps voice channels can be carried by this medium if we use DSSS with the barker sequences? 5

(b) Two channels, one with a bit rate of 150 Kbps and another with a bit rate of 140Kbps, are to be multiplexed using pulse stuffing TDM with no synchronization bits. Answer the following questions: 4
i) What is the size of a frame in bits?
ii) What is the frame rate?
iii) What is the duration of a frame?
iv) What is the data rate?

(c) What is the role of constellation diagram in analog transmission? Draw a constellation 3

Q.6. (a) Which types of connectors are used for coaxial cable? Why is coaxial cable is superior to twisted – pair cable? 4

(b) What is interleaving? Describe the full process of interleaving with appropriate figure. 4

(c) When do you use synchronous transmission and asynchronous transmission? We want to transmit 1000 characters with each character encoded as 8 bits. 4

i) Find the number of transmitted bits for synchronous transmission

ii) Find the number of transmitted bits for asynchronous transmission

Q.7. (a) How much invalid (unused) code sequence can we have in 5B/6B encoding? How many in 3B/4B encoding? 3

(b) We need a three-stage space division switch with N = 200. We use 10 cross–bars at the first and third stages and 4 cross–bars at the middle stage. 6

i) Draw the configuration diagram.

ii) Calculate the number of cross points.

iii) Find the possible number of simultaneous connections.

iv) Find the possible number of simultaneous connections if we use one single crossbar (200 * 200)

(c) What is the difference between omnidirectional waves and unidirectional waves? 3

Q.8. (a) What is the role of address field in a packet traveling through a virtual-circuit network? 3

(b) We mentioned that two types of networks: datagram and virtual-circuit, need a routing or switching table to find the output port from which the information belonging to a destination should be send out, but a circuit-switched network has no need for such a table. Give the reason for this difference. 3

(c) What are the Dirichlet conditions? Why these are necessary for Fourier series? 3

(d) Prove the shift property (both time and frequency shift) of Fourier transform. 3

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## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
### 3rd Year Odd Semester Examination 2018

COURSE NO: CSE 3101 COURSE TITLE: Database Systems
FULL MARKS: 72 TIME: 3 HRS

N.B. (i) Answer any **SIX** questions taking any **THREE** from each section.
(ii) Figures in the right margin indicate full marks.
(iii) Use separate answer script for each section.

## SECTION : A

Q.1. (a) What is database system? "A database is a tool for storing information efficiently" – justify this statement. 04

(b) List and describe four significant importance of database system over file processing system. 04

(c) Explain the distinctions among the primary key, foreign key and unique key. 04

Q.2. (a) What is E-R model? Draw an E-R diagram that includes a car insurance company with the following constraints. 06
i) Customers own one or more cars each.
ii) Each car has associated with it zero to any number of recorded accidents.
iii) Each car must be registered with at most one registration number.

(b) Describe the scenario with appropriate figure for the placement of relationship attribute for one-to-one, one-to-many, many-to-many and many-to-one relationship. 03

(c) Distinguish between strong and weak entity sets with appropriate example. 03

Q.3. (a) Illustrate the significance of using views in relational database. Also state the difficulties faced while updating view. 03

(b) Write queries to represent the following sentences in SQL. Use the database schema state below: 06
*instructor*(t_id,name, dept_name, salary). teaches(t_id, course_id, semester, year), student(s_id, name, dept_name, total_credit, born_year), takes(s_id, course_id, semester, year, grade). Advistor(s_id, t_id).
i) Create a view with those students name, ids and born_year who are from CSE, EEE or ETE departments.
ii) Find all instructors earning the highest salary in each department.
iii) Display the full name of instructors who are supervising 4 or more students.
iv) Find the number of instructors in each department who teach a course in 3rd year ODD semester.

(c) Write an assertion for the bank database to ensure that the sum of all loan amounts for each branch must be less than the sum of all account balances at the branch. 03

Q.4. (a) What are the anomalies that occurred in database. Illustrate with appropriate example. 03

(b) Suppose a company wants to store the complete address of each employee in "Employee_details" table which looks like below: 07

| emp_id | e_name | e_zip | e_state | e_city | e_district |
|---|---|---|---|---|---|

Consider that each attribute contains values. Is the table in 3NF? If not, make the table compatible with 3NF. Also determine the followings of this table.
i) super keys
ii) candidate key
iii) Non-prime attribute

(c) What are the advantages of PL/SQL over SQL in database management system? 02

## SECTION : B

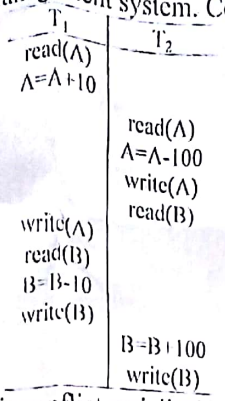
Q.5. (a) Consider the following hotel schema: Hotel( hotel_no, name, city), Room(room_no, hotel_no, type, price), Booking(hotel_no, room_no, guest_no, date_from, date_to), Guest(guest_no, name, address). Generate the relational algebra from the following queries: 06
i) List all single room with a price bellow Tk. 1000 per night.
ii) List all guest name, address, who were stayed in hotel "Bangla" from 05/03/2018 to 10/03/2018.
iii) Generate hotelwise booking summary from 01/01/2018 to 30/06/2018 and the summary should contain (hotel_no, number of guest, stayed, total income).

(b) Define cross product between two relations. Explain the problem of cross product operation with suitable example. 04

(c) Describe the importance of foreign key in relational database. 02

Q.6. (a) What are the differences between serial schedule and serializable schedule? Write down the major operations which are used in a transaction to access data. 04

(b) Define schedule in transaction management system. Consider the following schedule, 04




Determine whether the schedule is conflict serializable or not.

(c) Describe different states of a transaction by using state diagram. 04

Q.7. (a) Which protocols should be used in concurrent trasactions to preserve isolation property and how? 03

(b) Consider the following two transactions: 05

$T_1$:

```
r(A);
r(B);
if A=0 then B:=B+1
w(B)
```

$T_2$:

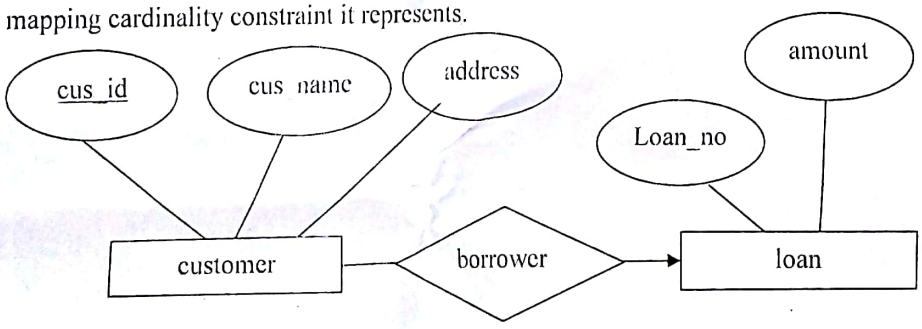
```
r(B);
r(A);
if B=0 then A:=A+1;
w(A);
```

Add lock and unlock instructions to $T_1$ and $T_2$ transactions, so that they maintain the two-phase locking protocol. Can the execution of these transactions result in a deadlock?

(c) Write a PL/SQL block to display top 10 employees details of an organization based on their salary. Consider the following database schema to write this block. 04
EMP(e_no, e_name, salary, experience)

Q.8. (a) Why the following keywords are used in SQL and PL/SQL: 04
i) % type ii) Group by
iii) Distinct iv)% not found

(b) Consider the following entity-relationship diagram and determine which type of mapping cardinality constraint it represents. 03




(c) Which type of constraints may be applied on a database schema and why they are necessary? Explain with example. 05

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