Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Gopalganj
Department of computer Science & Engineering

3rd year 1st Semester B.Sc. Engg. Examination-2018

Course No.: CSE302 Course Name: Operating System and System Programming

Full Marks: 60 Times: 3 Hours

N.B.:

i. Answer **SIX** questions, taking any **THREE** from each section.
ii. All questions are of equal values
iii. Use **separate answer script** for each section.

Section A

1. a) "An operating system is similar to a government"-explain this statement briefly with proper sketching. 3

   b) Define Multiprocessor system. What are the advantages of multiprocessor system. 3

   c) List and explain various types of operating system services. 4

2. a) What is the purpose of system program? 2

   b) What are the three major activities of an OS in regard to memory management? 4

   c) Draw the MS-DOS layer structure and Unix system structure. 4

3. a) What is meant by process, program and process control block? Show a process control block for a particular process. 4

   b) Consider the following set of processes, with the length of the CPU burst given in milliseconds: 6

Process	Burst time	Arrival time
P_1	10	0
P_2	4	1
P_3	5	3
P_4	3	5
P_5	6	4

   i) Draw the Gantt chart that illustrates the execution of these processes using the SJF scheduling algorithm.
   ii) Find the response, waiting and turnaround time of each process for SJF scheduling algorithm.

4. a) Write down several reasons for providing an environment that allows process cooperation. 3

   b) List the optimization criteria of CPU scheduling algorithm. 2

   c) Define the process scheduler. Explain the functions of various process schedulers. 3

   d) Which CPU scheduling algorithms could result in starvation and convoy effect? 2

Section B

5 a) Draw the resource-allocation graph for the following criteria: 4
The sets P, R, and E:
$P= \{ P_1, P_2, P_3\}$
$R= \{R_1, R_2, R_3, R_4\}$
$E= \{P_1 \rightarrow R_1,\ P_2 \rightarrow R_3,\ R_1 \rightarrow P_2,\ R_2 \rightarrow P_2,\ R_2 \rightarrow P_1,\ R_3 \rightarrow P_3,\ P_3 \rightarrow R_4,\ R_4 \rightarrow P_2\}$
Resource instances: $R_1= 1$, $R_2 = 2$, $R_3= 1$, $R_4= 4$.
Is there exist deadlock?

   b) "A cycle in the graph is a necessary but not a sufficient condition for the existence of deadlock"-explain this by drawing the required resource-allocation graph. 4

   c) Is it possible to have a deadlock involving only one single-threaded process? Explain your answer. 2

6 a) What is swapping? Explain with figure. 3

   b) Consider a logical address space of 64 pages of 1024 words each mapped onto a physical memory of 32 frames.
      (i) How many bits are there in the logical address? 2
      (ii) How many bits are there in the physical address? 2

   c) Discuss paging technique with example. 3

7 a) What is virtual memory? 1

b) Consider the following page reference string: 6
1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.
(i) LRU replacement
(ii) FIFO replacement
(i) Optimal replacement

c) What do you mean by context-switch? Draw a diagram where CPU switches from process to process. 3

8 a) Draw a resource-allocation graph and corresponding wait-for graph. 2

b) Consider a disk where blocks 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 17, 20, 22, 23, 25 are free, and the rest of the blocks are allocated. Calculate the free-space bit map. 2

c) What is directory? Discuss the directory structure of a file. 3

d) Explain indexed allocation with appropriate figure. 3

Bangabandhu Sheikh Mujibur Rahman Science & Technology University
Department of Computer Science and Engineering
3rd Year 1st Semester B.Sc. (Engg.)Final Examination-2018

Course No.: CSE320 **Course Title: Database Management Systems**

Full Marks: 60 **Time: 3 hours**

N.B.:
i) Answer **SIX** questions taking, any **THREE** from each section.
ii) All questions are of equal values.
iii) Use separate answer script for each section.

Section-A

1. a) What is DBMS? What are the goals of a DBMS? 2

   b) Define the left outer join and right outer join. Compute the full outer join operation for the relation R1 and R2 given below- 5

R1

A	B	C
a1	b1	c1
a3	b2	c2

R2

D	A	F
d1	a1	f1
d1	a2	f2

   c) Define mapping cardinalities. Discuss each type of mapping cardinalities. 3

2. a) Transform the following ER diagram (**Figure-1**) into relations. [(*) sign indicates the identifying attribute] 7

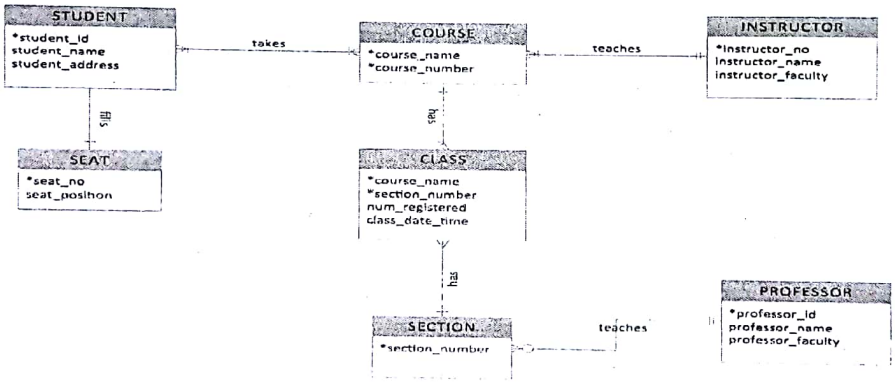


Figure-1:ER diagram.

   b) Compare the following terms with suitable example: 3
   i. Generalization and Specialization ii. Overlap and disjoint specialization

3. a) Normalize the table below up to 3NF which is about owners and the boat(s) theyowned. 7

OwnerNum	LastName	FirstName	BoatName	Weight	Marina
AD57	Adney	Bruce and Jean	AdBruce X	1,000 lbs	East
			Zinger	1,500 lbs	East
AN75	Anderson	Bill	Yellow Beast	2,000 lbs	West
BL72	Blake	Mary	Kumodo	1,200 lbs	East
			Kryptonite	1,000 lbs	West
EL25	Elend	Sandy and Bill	Shark Fin	1,300 lbs	East
			Two Cute	900 lbs	East
			Ride North	1,400 lbs	West

   b) When a bucket is overflowed? Explain with proper example. 3

4. Suppose you are given the following requirements for a simple database for the National Hockey League (NHL): 10
   - the NHL has many teams,
   - each team has a name, a city, a coach, a captain, and a set of players,

- each player belongs to only one team,
- each player has a name, a position (such as left wing or goalie), a skill level, and a set of injury records,
- a team captain is also a player,
- a game is played between two teams (referred to as host_team and guest_team) and has a date (such as May 25th, 2018) and a score (such as 4 to 2).

Construct a clean and concise ER diagram for the NHL database.

Section-B

5. Consider the relational database of **Figure-2**, where the primary keys are underlined. 10

DEPARTMENT(*dept name*, *building*, *budget*)
INSTRUCTOR(*ID*, *name*, *dept name*, *salary*)
TEACHES(*ID*, *course id*, *sec id*, *semester*, *year*)
TAKES(*ID*, *course id*, *sec id*, *semester*, *year*, *grade*)

Figure-2: Database schemas.

Write SQL expressions for the following queries:

i) Find the names and average salaries of all departments whose average salary is greater than 50000.
ii) Find the total number of (distinct) studentswho have taken course sections taught by the instructor with *ID* 10101.
iii) Find names of instructors with salary greater than that of some (at least one) instructor in the CSE department.
iv) Delete all tuples in the *instructor* relation for those instructors associated with a department located in the Block_1 building.
v) Increase salaries of instructors whose salary is over $100,000 by 2%, and all others receive a 3% raise.

6. a) Consider the relational database of **Figure-3**, where the primary keys are underlined. Give an expression in the relational algebra to express each of the following queries: 6

BRANCH(*branch name*, *branch city*, *assets*)
CUSTOMER (*customer name*, *customer street*, *customer city*)
LOAN (*loan number*, *branch name*, *amount*)
BORROWER (*customer name*, *loan number*)
ACCOUNT (*account number*, *branch name*, *balance*)
DEPOSITOR (*customer name*, *account number*)

Figure-3: Database schemas.

i. Find all loan numbers with a loan value greater than $10,000.
ii. Find the names of all depositors who have an account with a value greater than $6,000.
iii. Find the names of all depositors who have an account with a value greater than $6,000 at the "Gopalganj" branch.

b) What is aggregate function? Discus different types of aggregate function. 2
c) Explain the difference between a weak entity set and a strong entity set. 2

7. a) The following set of key values are given for constructing B^+-tree: 5

(2, 12, 19, 25, 30, 37, 43, 49, 55, 60, 68, 75, 90)

Assume that the tree is initially empty and values are added in ascending order. Now Construct B^+ -tree such that maximum three pointers are fitted in each node.

b) Differentiate between dense and sparse index in three points. 3
c) What do you mean by uniformity and randomness of ideal hash function? 2

8. a) Suppose a relation *order*, contains four attributes i.e. order ID, orderdate, total price and customer ID, where order ID is the primary key and customer ID is the foreign key, comes from the relation *customer*. Now do the following tasks using the SQL command: 5

i. Create a table for the *order* relation.
ii. Add a new attribute "order description" to the this relation and
iii. Delete the attribute "total price" from this relation.

b) During its execution, a transaction passes through several states. Draw the state diagram of transaction and define each of them briefly 3
c) Explain the condition for lossless-join decomposition. 2

Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science & Engineering
3rd Year 1st Semester B.Sc. Engineering Examination-2018

Course Code: CSE312 **Course Title:** Computer Networks
Full Marks: 60 **Time:** 3 hours

N.B.
i) Answer **SIX** questions, taking any **THREE** from each section.
ii) All questions are of equal values.
iii) Use separate answer script for each section.

SECTION-A (30 Marks)

Q.1 (a) Discuss the similarities and differences of OSI and TCP/IP reference models. 5
(b) What are the differences between Public and Private ASP Address. 2
(c) How TCP connection Establish and close? 3

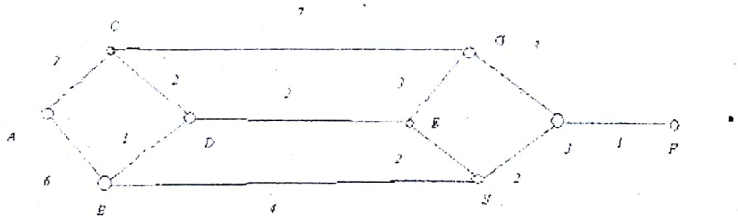
Q.2 (a) Write short note on i. HDLC ii. PPP 4
(b) Find out the hamming code for "BSMRSTU". 6

Q.3 (a) How Collison handled with the CSMA/CD? 4
(b) Write down the drawback of repeaters. 3
(c) Draw the UDP header and explain its fields. Why is there no "ACK" or "Sequence number" field? 3

Q.4 (a) What are the differences between Supernetting and Subnetting? 2
(b) Suppose In your university has a range of IP addresses 192.168.32.0/20. You have to create at least 15 usable subnets so that each subnet contains as many addresses as possible. Answer the following: 8
i. What is the class of given IP block?
ii. How many usable subnets will be created?
iii. How many usable IP addresses will be there in each subnet?
iv. What will be the subnet mask of the fourth subnet?
v. What will be the second usable IP address of the second usable subnet?
vi. Find out how many IPs are being lost in this subnetting.

SECTION-B (30 Marks)

Q.5 (a) What will be the transmitted frame if the given frame is 101100111 using the generator: $G(x)= x^3 + x^2 + 1$ when CRC code is used? 4
(b) Using the Dijkstra's algorithm find the shortest path from A to F of the following network. 6



Q.6 (a) Describe a scenario where it is preferable to use virtual LAN (VLAN). Explain how VLAN can be implemented using VLAN aware switches. 4
(b) Describe in short how Hamming Codes are used to perform error correction. 2
(c) Find out the cipher text of "Bangabandhu Sheikh Mujibur Rahman" for the key "BSMRSTU" using transposition cipher method. 4

Q.7 (a) Write down the difference between static and dynamic routing. 2
(b) Why is distance vector routing algorithm not suitable for large networks? Explain with example. 4
(c) Describe the Leaky bucket Algorithm. 4

Q.8 (a) Write down the difference between congestion control and flow control. 2
(b) How congestion is controlled by Datagram Subnet? 4
(c) Write short notes on: 4
(i) DNS
(ii) SMTP
(iii) DHCP

Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of Computer Science and Engineering

3rd Year 1st Semester Final B.Sc. Engineering Examination-2018

Course Code: CSE310 **Course Title: Computer Architecture and Organization**

Total Marks: 60 **Time: 3 (Three) Hours**

N.B.

i. Answer **SIX** questions taking any **THREE** from each section.

ii. All questions are of equal values.

iii. Use separate answer script for each section.

Section: A

1. a) Draw the flow chart diagram of the division algorithm. 4

b) Draw the diagram of division hardware. 3

c) What decimal number is represented by this single precision float? 3

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	1	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

2. a) What is a pipeline hazard? What are the different types of pipeline hazards? Explain with examples. 4

b) Present a scenario when you cannot solve a data hazard with the help of a forwarding unit. Suggest what to do in this case. 4

c) Reorder the following sequence of instructions to avoid pipeline stalls: 2

```
lw $t1, 20($t7)
add $t3,$t1,$t2
add $t5,$t3,$t4
sub $t3,$t2,$t4
```

Assume that forwarding is available in this pipelined processor.

3. a) A memory unit has a capacity of 8192 words of 32 bits per word. 4

i. How many flip-flops are needed for MAR and MBR?

ii. How many words will the memory unit contain if the address register has 15 bits?

b) Draw the block diagram of a memory unit with a capacity of 1K words of 16 bits each, showing all inputs and outputs. 3

c) Show the hardware that implements the following statement. Include the logic gates for the control function. 3

$$y'xT_0 + T_1 + x'yT_2: \leftarrow A + B$$

4. a) What are the 'direct mapped', 'set associative', and 'fully associative' cache schemes? 3

b) Define write-back cache in handling writes. 1

c) Assume there are three small caches, each consisting of 4 one-word blocks. One each is fully associative, another one is 2-way set associative, and the third one is direct mapped. Find the number of misses for each cache organization given the following sequence of block addresses: 0, 4, 0, 2, 6, 8. 6

P.T.O

Section: B

5. a) Write down the differences between SRAM and DRAM. 4

   b) How many total bits are required for a direct mapped cache with 4KB of data and 2-word blocks, assuming a 32-bit address? 3

   c) "The TLB acts as a cache of the page table for the entries that map to physical pages only" - Do you agree or disagree? Explain. 3

6. a) What do you understand by the 'virtual memory' scheme? 2

   b) Draw the mapping from a 32-bit virtual address to a 30-bit physical address using a page table. 4

   c) Consider the following MIPS instructions: 4

   (i) `lw $t6, 36($s1)`

   (ii) `add $t5,$s5,$s5`

   What do these instructions perform in EX and MEM stages?

7. a) What is computer architecture? Why computer architecture need to study? 2

   b) The hardware designer supplied the instruction class and average clock cycles per instruction (CPI) (see table-1) and two code sequences and instruction counts for instruction class (see table-2). 6

Table-1

Instruction Class	CPI for these classes
A	1
B	2
C	3

Code Sequence	Instruction Counts for instruction class		
	A	B	C
1	2	1	2
2	4	1	1

   i. Which code sequence executes the most instructions?

   ii. Which will be faster?

   iii. What is the CPI for each sequence?

   c) If machine A runs a program in 10 seconds and machine B runs the same program in 15 seconds, how faster is A than B? 2

8. a) Describe five MIPS addressing modes. 5

   b) What is Least recently used (LRU) scheme? 1

   c) A code snippet of MIPS instructions and its machine code with addresses are given. What is the problem in here? How can you solve this problem? 4

```
Loop: … …
      … … … …
      j   Loop
Exit: … …
```

```
00500
....
00536
00540
```

	.....
	.....
2	00500
	.....

Bangabandhu Sheikh Mujibur Rahman Science & Technology University
Department of Computer Science & Engineering Department
3rd Year 1st Semester B.Sc. Engineering Examination-2018

Course Code: CSE300 **Course Title: System Analysis and Design**
Full Marks: 60 **Time:3(Three)hours**

N.B.
i) Answer **SIX** questions, taking any **THREE** from each section.
ii) All questions are of equal values.
iii) Use separate answer script for each section.

SECTION-A

Q.1 (a) What is Use Case Diagram? Draw the Use Case Diagram for Hall Management System. 6
(b) What is the relation between analysis and design? Is it possible to design a system without analysis? If yes how? If not why? 4

Q.2 (a) How to formulate project goals and quantify them? 3
(b) What is Level DFD? Write down the advantages of Level DFD. 3
(c) Describe the general strategy an analyst should use to gather information and Mention the possible sources of information when you are asked to analyze the department of CSE, BSMRSTU. 4

Q.3 (a) How to detect Incompleteness, Ambiguity, Contradictions & Redundancy in Decision Table specification? 3
(b) What is the Linked Decision Table? Explain it with a proper example. 3
(c) What is process specification? A customer requests a cash withdrawal. One of the business rules for the ATM is that the ATM machine pays out the amount if the customer has sufficient funds in their account or if the customer has the credit granted. Now Draw the Decision Table from the Word Statement. Briefly explain about it. 4

Q.4 (a) Write down the Life Cycle of Systems Analysis and Design. Briefly explain about the each steps of Life Cycle. 7
(b) What is the Relationship Between Interaction and Class Diagrams? 3

SECTION-B

Q. 5 (a) Write down the difference between Slack and Surplus Variables. 2
(b) Find the maximum value of Z using Simplex Method 8
$5X_1+10X_2<=60$
$2X_2+2X_1<=40$
$X_1, X_2 >=0$
$Z=6X_1+8X_2$

Q.6 (a) A small project is consists of 9 activities for which relevant data are given below. 5

Activity	Immediate predecessors	Completion Time (week)
A	-	5
B	-	6
C	A,B	4
D	A	3
E	A	1
F	E	4
G	D,F	14
H	B,C	12
I	G,H	2

a) Draw the network and project completion time
b) Find the critical path for this project

(b) What are the mistakes in each of the DFDs of Fig. 1(a)–1(c)? Correct these mistakes. 5

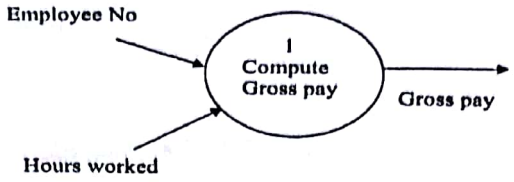


Figure:1(a)

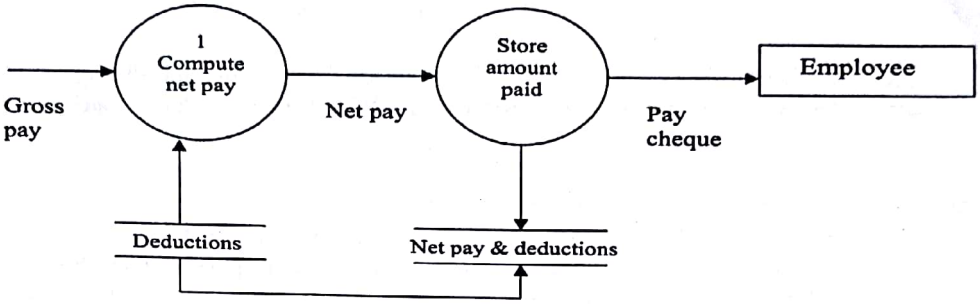


Figure:1(b)

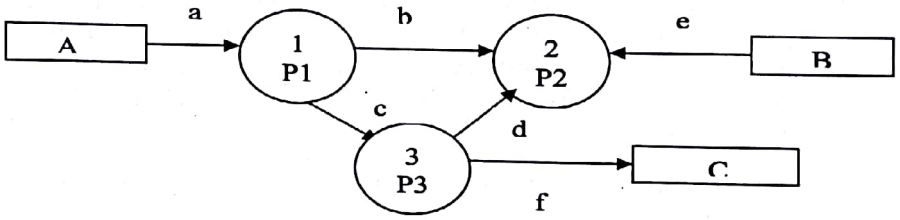


Figure.1(c)

Q.7 (a) What is Project Management? Which factors must be considered when selecting a software project team? 5

(b) What are the qualities of information? 2

(c) Is up-to-date information always timely? If not, give an example of up-to-date but not timely information? 3

Q.8 (a) Distinguish between technical, operational, and economic feasibility. 3

(b) Write down the steps in Feasibility analysis. 4

(c) Give an example of a solution which is technically feasible, but not operationally feasible. 3