

# 1. EAD



PUNJAB ENGINEERING COLLEGE, CHANDIGARH

Mid-Term Examination, February 2020

Programme : B.E. (CSE)

Year/Semester: 4<sup>th</sup> Sem

Course Name : Engineering Analysis and Design

Course Code: CSN 206

Maximum Marks: 30

Time allowed: 90 Mins

Notes: (i) All questions are compulsory.  
(ii) Assume suitably and state, additional data required, if any.

1. Identify the type of information system application with brief justification, described for each of the following: (08)
  - I. The bank manager gets an end-of-day report that shows all tellers whose cash drawers don't balance with the cash register summary report.
  - II. A doctor keys in data describing symptoms of a patient, she receives a report that suggests what illness the patient is likely suffering from and a detailed explanation concerning the rationale as to why the symptoms suggests that particular illness.
  - III. Facts based bank report to raise interest rates paid to customers to attract more deposits.
  - IV. To start a completely new banking service.
2. Order the following tasks in terms of the system development life cycle: acceptance testing, ~~project planning~~, unit testing, ~~requirements review~~, cost estimation, high level design, low level design, design review, development, ~~requirements specification~~. (05)
3. Give an example of a completely manual information system. Describe how information technology might improve that information system. (05)
4. Choose an organization that you interact with regularly (or you understand) and list as many different systems/subsystems/activities whether computerized or manual as you can that are used to process transactions, provide information to managers and executives, help managers and executives make decisions, capture knowledge and provide expertise, help design products or facilities and assist people in communicating with each other. Out of this list identify the type of information system they are. Draw a zero level data flow diagram that shows how each of these systems interacts or should interact with each other. (12)

Programme: B.Tech. CSE  
Course Name: Computer Networks  
Maximum Marks: 30

Year/Semester: 2<sup>nd</sup> year/2<sup>nd</sup> Sem, 19202  
Course Code: CSN 210  
Time allowed: 1½ hours

Notes:

2.CN

- All questions are compulsory.
- Unless stated otherwise, the symbols have their usual meanings in context with subject. Assume suitably and state additional data required, if any.
- The candidates, before starting to write the solutions, should please check the question paper for any discrepancy, and also ensure that they have been delivered the question paper of right course code.
- Explain steps involved wherever necessary.

Q. No.	Marks
1.	3×2=6
<p>Consider Figure 1, for which there is an institutional network connected to the Internet. Suppose that the average object size is 850,000 bits and that the average request rate from the institution's browsers to the origin servers is 16 requests per second. Also suppose that the amount of time it takes from when the router on the Internet side of the access link forwards an HTTP request until it receives the response is three seconds on average. Model the total average response time as the sum of the average access delay (that is, the delay from Internet router to institution router) and the average Internet delay. For the average access delay, use <math>\Delta/(1 - \Delta\beta)</math>, where <math>\Delta</math> is the average time required to send an object over the access link and <math>\beta</math> is the arrival rate of objects to the access link.</p> <p>a. Find the total average response time.</p> <p>b. Now suppose a cache is installed in the institutional LAN. Suppose the miss rate is 0.4. Find the total response time.</p>	
<p>Figure 1: Bottleneck between an institutional network and the Internet</p>	



2. How long does it take to send a file of 640,000 bits from host A to host B over a circuit-switched network? Suppose that All links in the network use TDM with 24 slots and have a bit rate of 1.536 Mbps. Also suppose that it takes 500 msec to establish an end-to-end [redacted] lost A can begin to transmit the file.

3

3. Suppose there is a 10 Mbps microwave link between a geostationary satellite and its base station on Earth. Every minute the satellite takes a digital photo and sends it to the base station. Assume a propagation speed of  $2.4 \times 10^8$  meters/sec.

$2 \times 3 = 6$

- What is the propagation delay of the link?
- What is the bandwidth-delay product?
- Let  $x$  denote the size of the photo. What is the minimum value of  $x$  for the microwave link to be continuously transmitting?

4. Consider the sliding window protocols shown in below figures.

$2 + 5 + 1 = 8$

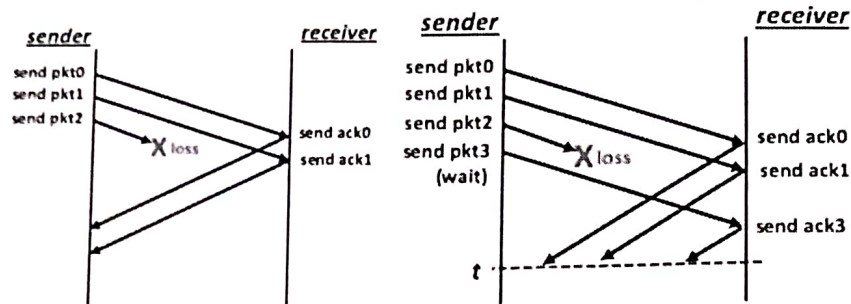


Figure 2(a)

Figure 2(b)

- In figures 2(a) and 2(b), identify whether Go-Back-N is being used, Selective Repeat is being used, or there is not enough information to tell? Explain your answer briefly.
- In figure 2(b), suppose the sender and receiver windows are of size  $N = 4$  and suppose the sequence number space goes from 0 to 15. Show the position of the sender and receiver windows over this sequence number space at time  $t$  (the horizontal dashed line). Give a list of all possible future events at the sender resulting from the ACKs currently propagating from receiver to sender at time  $t$ . For each of these events, indicate the action taken at the sender (only).
- Suppose that it takes 1 ms to send a packet, with a 10 ms one-way propagation delay between the sender and receiver. The sliding window size is again  $N = 4$ . What is the channel/link utilization?

5. Consider distributing a file of  $F = 15$  Gbits to  $N$  peers. The server has an upload rate of  $u_s = 30$  Mbps, and each peer has a download rate of  $d_i = 2$  Mbps and an upload rate of  $u$ . For  $N = 10, 100$ , and  $1,000$  and  $u = 300$  Kbps, 700 Kbps, and 2 Mbps, compute the minimum distribution time for each of the combinations of  $N$  and  $u$  for both client-server distribution and P2P distribution.

5

6. Why is it said that FTP sends control information "out-of-band"?

2

3. OS

Notes:

- All questions are compulsory.
- The candidates, before starting to write the solutions, should please check the question paper for any discrepancy, and also ensure that they have been delivered the question paper of right course code.

Sr. No.	Question	Marks																		
1	<p>(a) Differentiate between multiprogramming, multiprocessing, timesharing and distributed systems? (5M)</p> <p>(b) List five services provided by an operating system. Explain how each provides convenience to the users. Explain in which case it would be impossible for the user-level programs to provide these services. (5M)</p>	10																		
2	<p>Consider the following set of processes with the length of the CPU burst time given in milliseconds:</p> <table border="1"> <thead> <tr> <th>Process</th><th>Burst Time</th><th>Priority</th></tr> </thead> <tbody> <tr> <td>P1</td><td>10</td><td>3</td></tr> <tr> <td>P2</td><td>1</td><td>1</td></tr> <tr> <td>P3</td><td>2</td><td>3</td></tr> <tr> <td>P4</td><td>1</td><td>4</td></tr> <tr> <td>P5</td><td>5</td><td>2</td></tr> </tbody> </table> <p>The processes are assumed to have arrived in order P1, P2, P3, P4, P5 all at time 0.</p> <p>a. Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a non-preemptive priority (a smallest priority no implies higher priority) and <u>RR</u> (quantum = 1) scheduling (4M)</p> <p>b. What is the turnaround time for each process for each of the scheduling algorithm for part a? (2M)</p> <p>c. What is the waiting time for each process for each of the scheduling algorithm for part a? (2M)</p> <p>d. Which of the schedules in part a results in the minimal average waiting time. (2M)</p>	Process	Burst Time	Priority	P1	10	3	P2	1	1	P3	2	3	P4	1	4	P5	5	2	10
Process	Burst Time	Priority																		
P1	10	3																		
P2	1	1																		
P3	2	3																		
P4	1	4																		
P5	5	2																		
3	<p>a) Consider the fixed partitioning scheme with contiguous memory allocation. The five memory partitions of size 100 KB, 500 KB, 200 KB, 450 KB and 600 KB are to be filled. Given an ordered sequence of requests for blocks of size 212 KB, 417 KB, <del>112 KB</del> and 426 KB, rank the space allocation algorithms in terms of how efficiently they use memory. [7 M]</p> <p>b) In the above example, comment on the efficiency of the algorithms when variable partitioning scheme is used. (3M)</p>	10																		



# Examination

Programme: **B.Tech-CSE**  
 Course Name: **Database Management Systems**  
 Maximum Marks: **30**  
 SID:

Year/Semester: **2020/4th**  
 Course Code: **CSN208**  
 Time allowed: **90 mins**

**4. DBMS**

## Notes:

- All questions are compulsory. This question paper consists of two pages.
- Unless stated otherwise, the symbols have their usual meanings in context with subject. Assume suitably and state, additional data required, if any.
- The candidates, before starting to write the solutions, should please check the question paper for any discrepancy, and also ensure that they have been delivered the question paper of right course code.

Q. No.	Question	Marks																
1.	Consider Dean Academic Affairs (DAA) office of PEC that maintains data about the following entities: (a) courses, including number, title, credits, syllabus, and prerequisites; (b) course offerings, including course number, year, semester, section number, instructor(s), timings, and classroom; (c) students, including student-id, name, and program; and (d) instructors, including identification number, name, department, and title. Further, the enrolment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modelled. Construct an E-R diagram for the DAA office. Document all assumptions that you make about the mapping constraints. Can we have a weak entity in the given scenario?	(8)																
2.	Consider the following two tables C and D. What will be the output of following relational algebra query:  <table><tr><th colspan="2">C</th><th colspan="2">D</th></tr><tr><th>Num</th><th>Square</th><th>Num</th><th>Cube</th></tr><tr><td>2</td><td>4</td><td>2</td><td>8</td></tr><tr><td>3</td><td>9</td><td>3</td><td>27</td></tr></table> (i) $C * D$ (ii) $\pi_{Num}C \cap \pi_{Num}D$ (iii) $\pi_{Num}C \cup \pi_{Num}D$	C		D		Num	Square	Num	Cube	2	4	2	8	3	9	3	27	(6)
C		D																
Num	Square	Num	Cube															
2	4	2	8															
3	9	3	27															
3.	In any relation there should be an attribute that can provide uniqueness. In such scenario how can you define a primary key and what are conditions that an attribute must satisfy to become a primary key?	(2)																
4.	Consider a disk pack with a seek time of 4 milliseconds and rotational speed of 10000 rotations per minute (RPM). It has 600 sectors per track and each sector can store 512 bytes of data. Consider a file stored in the disk. The file contains 2000 sectors. Assume that every sector access necessitates a seek, and the average rotational latency for accessing each sector is half of the time for one complete rotation. Calculate the total time (in milliseconds) required to read the entire file.	(4)																

5. Consider a file of 16384 records. Each record is 32 bytes long and its key field is of size 6 bytes. The file is ordered on a non-key field, and the file organization is unspanned. The file is stored in a file system with block size 1024 bytes, and the size of a block pointer is 10 bytes. If the secondary index is built on the key field of the file, and a multi-level index scheme is used to store the secondary index, then (5)

- Find the number of first-level blocks in the multi-level index
- Find the number of second-level blocks in the multi-level index

6. A file has  $r = 20,000$  STUDENT records of fixed length. Each record has the following fields: NAME (30 bytes), SSN (9 bytes), ADDRESS (40 bytes), PHONE (9 bytes), BIRTHDATE (8 bytes), SEX (1 byte), MAJORDEPTCODE (4 bytes), MINORDEPTCODE (4 bytes), CLASSCODE (4 bytes, integer), and DEGREEPROGRAM (3 bytes). An additional byte is used as a deletion marker. The file is stored on the disk and block size is 512 bytes. (5)

- Calculate the record size  $R$  in bytes.
- Calculate the blocking factor  $bfr$  and the number of file blocks  $b$ , assuming an unspanned organization.
- Calculate the average time it takes to find a record by doing a linear search on the file
- Assume that the file is ordered by SSN; calculate the time it takes to search for a record given its SSN value, by doing a binary search.
- If Index table entry is of 32 bytes then calculate the time it takes to search the record, both for dense and sparse indices.

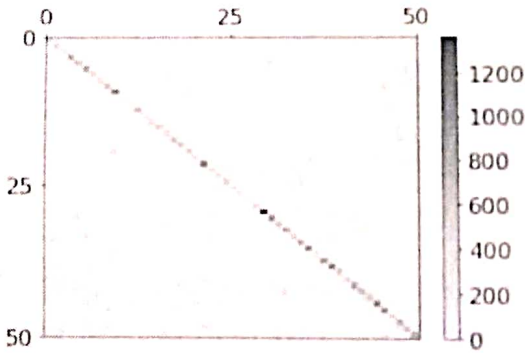


Programme: B.Tech (CSE)  
 Course Name: Machine Learning  
 Maximum Marks: 30

5. ML

## Notes:

- All questions are compulsory.
- The candidates, before starting to write the solutions, should please check the question paper for any discrepancy, and also ensure that they have been delivered the question paper of right course code.

Q. No.		Marks
1. a)	<p>Assume you are preparing a data frame for a supervised learning task and you notice that the target label classes are highly imbalanced and multiple feature columns contain missing values. The proportion of missing values across the entire data frame is less than 5%. Which is best option from following to minimize bias due to missing values? Give comment for each option.</p> <p>(i) Replace each missing value by the mean or median across non-missing values in same row.</p> <p>(ii) Delete observations that contain missing values because these represent less than 5% of the data.</p> <p>(iii) Replace each missing value by the mean or median across non-missing values in the same column.</p> <p>(iv) For each feature, approximate the missing values using supervised learning based on other features.</p>	04
b)	What is a hyperparameter and why is it needed in training and learning process? What is the risk with tuning hyperparameters using a test dataset?	04
2. a)	<p>Assume you are given data <math>\{(x^1, y^1), \dots, (x^n, y^n)\}</math> and you are planning to train an SVM. You define a kernel <math>k</math> and obtain a kernel matrix <math>K</math> presented in figure below, where <math>K_{ij} = k(x^i, x^j)</math>.</p>  <p>(i) What is the issue here?</p> <p>(ii) How can we address this issue?</p> <p>(iii) Why is it important to scale the inputs when using SVMs?</p>	06
b)	A data scientist runs a principal component analysis on given data and observes that the percentage of variance explained by the first 3 components is 80%. How this percentage of variance explained is computed? Outline a broader process for same.	04
3.	Given regression (linear or logistic) and naïve bayes classifier, differentiate the purpose of using these classifiers for a given dataset. Which of these two is considered to be high bias/low variance classifier? Justify with appropriate reason.	06
4.	<p>With respect to different feature subset selection strategies, answer following precisely:</p> <p>(i) State the feature subset selection problem mathematically.</p> <p>(ii) How do the objective function in <i>filters</i> and <i>wrappers</i> differ?</p> <p>(iii) Analyze the primary motivation behind Bidirectional search.</p>	06

6. μP

Subject: Microprocessor and Applications (CSN-207)

Max marks--25

Branch: BE CSE-IV SEM

Time - 1.5 hour

- Attempt question as per weightage, ratio (15 words/marks may be appropriate)
- Save Time. Write to the point brief answers avoid unnecessary explanation
- Attempt all sub question in sequence of same question

1. Explain the concept of segmented memory access and what are its advantages? Draw architecture diagram of 8086 to explain what element is been added to support it. [4]  
[2+1+1]

What will be the contents of register BL after the last instruction execution? [3]

MOV BX, 14H  
MOV CL, 03H  
SHL BX, CL  
SAR BX

3. Identify the addressing modes for the following instructions. Write the expression of calculating physical address for each in terms of offset and segment address. Write value of "MOD" field required to translate them in machine code. [6]

- 1. MOV CL, 34H
- 2. MOV BX, [4172H]
- 3. MOV DS, AX
- 4. MOV AX, [SI + BX + 04]

4. How different Flags and registers are used for execution of following string manipulation instruction [4]

- a. REP MOVSB
- b. REPE CMPS
- c. REPNE SCAS

5. How many times LOOP1 will be executed in the following program? What will be the contents of BL after the execution? Write same task using LOOP instruction [4]

MOV BL, 00H  
MOV CL, 05H  
LOOP1: ADD BL, 02H  
DEC CL  
JNZ LOOP1

6. Differentiate briefly between minimum and maximum mode, do write different signals used for them on Pin 24 to Pin 31. [4]