Dhirubhai Ambani Institute of Information & Communication Technology
Mid Semester Test-2, 1st Semester 2018- 19

Course Title	IT304 Computer Networks		**Max Marks**	25
Date	16 October 2018	**CLOSED BOOK**	**Time**	90 min

1. Using clear examples, briefly explain the working of DHCP, NAT, and CIDR. Describe how these protocols help in more efficient use of the Internet address space. [5]

2. A router is said to be congested if its buffer and packet forwarding resources are inadequate to handle incoming flows for a sustained period. TCP has the mechanism to manage congestion. In this context,
   a. What is the effect of congestion on the TCP and UDP flows passing through the congested router?
   b. What is the effect of congestion on the two TCP flows with unequal round trip times passing through the congested router.
   c. How is TCP protocol ack-timeout calculated? Give justification.
   d. Briefly describe the connection establishment and termination mechanisms in TCP. Explain the rationale for using such a mechanism and the role of the initial sequence number.

   [4*2]

3. Draw the sort network, shuffle-exchange network, and the Banyan network for a 8x8 Batcher-Banyan switch. What additional modules/functionalities are needed to make this switch perform as an Internet router? [5]

4. Compute the average throughput of a TCP connection if the packet loss probability is p and the round trip time is T (constant). What would be the effect on throughput if the round trip time is not a constant but varies between $T - \Delta$ to $T + \Delta$. ($\Delta << T$) [4]

   $\frac{1.22\ MSS}{RTT\sqrt{L}}$ $\frac{0.75\ MSS}{RTT}$

5. Estimating the correct buffer size is important as an overestimate makes the router unnecessarily costly and underestimate leads to frequent buffer overflow and packet loss. Assuming that the traffic is predominantly TCP, derive an expression for the *buffer size* as a function of relevant router and flow parameters. [3]

In-Semester Exam-IV (Autumn'2017)
IT 214 Database Management Systems

Time: 75 minutes

Max Points: 75

IMPORTANT NOTE:
1. Write answers neat and clean. Answers that are difficult to read may simply be discarded.
2. In all questions marks awarding strategy will be discrete (i.e., 0, half, and full marks).

1. Consider Company Schema. Write a stored function (in pseudo code) that computes standard deviation of salary from EMPLOYEE relation and returns.

   Formula for standard deviation is given here for your reference.

   $$SD = \sqrt{\frac{\sum(x-\bar{x})^2}{n}}$$

   [20]

2. What are the parameters to getConncection message in JDBC?

   [5]

3. Consider Indian Railways scenario from one of a Lab. It has been copied here in the box below for your reference. A short name for every attribute is given in parenthesis.

   [20]

Train_Number(**TN**) – every train has unique number. For same pair of stations a train has different numbers for to and return.

Train_Run_Day (**DAY**) – like Monday, Tuesday or so; it is day of run from source station
[note that train may not run on all days of a week]

Source_Station_Code (**SRC_SCODE**) – like ADI for Ahmedabad and is unique.

Destination_Station_Code (**DST_SCODE**)

Station_Code (**SCODE**) – any other station on train route

Date_of_Run (**DATE**) – a particular date of run

Scheduled_Arrival_Time (**SAT**) – on a station; assume that train arrives at a on same time on all days.

Scheduled_Departure_Time (**SDT**) – from a station

Expected_Arrival_Time (**EAT**) – on the run date on a station

   a. List down minimal FD set on all attributes given here.

   b. Beginning from a single schema R, given below, derives BCNF relations using BCNF decomposition algorithm. Make sure that no FD is lost.

      R(TN, DAY, SRC_SCODE, DST_SCODE, SCODE, DATE, SAT, SDT, EAT)

4. Are following FD sets F and G are equivalent (Yes or NO, Give proofs) - [10]

F = {A → B, AB → C, D → E} and G = {A → BC, D → AE}

5. Give a relation R(ABCDEF), and following FD set F [10]

$A \rightarrow B; A \rightarrow C; CD \rightarrow E; CD \rightarrow F; B \rightarrow E$

Do following FDs are inferred from F? Yes/No, Give Proof.

$A \rightarrow E$
$CD \rightarrow EF$
$AD \rightarrow F$
$B \rightarrow CD$

6. Given a relation R(ABCDEF), and following FDs [10]

$ABC \rightarrow E$
$ABCD \rightarrow F$

What is the key? What normal form it is in? Name FD that violates requirement of next immediate higher normal form.

Can you loss-lessly decompose R into BCNF? If yes, give decomposed relations.

Q-2 Q-3
14 + 8 ½ 25.5 (4P) + 1.½ + 3 = 53.5

In-Semester Exam-III (Autumn'2017)
IT 214 Database Management Systems

A

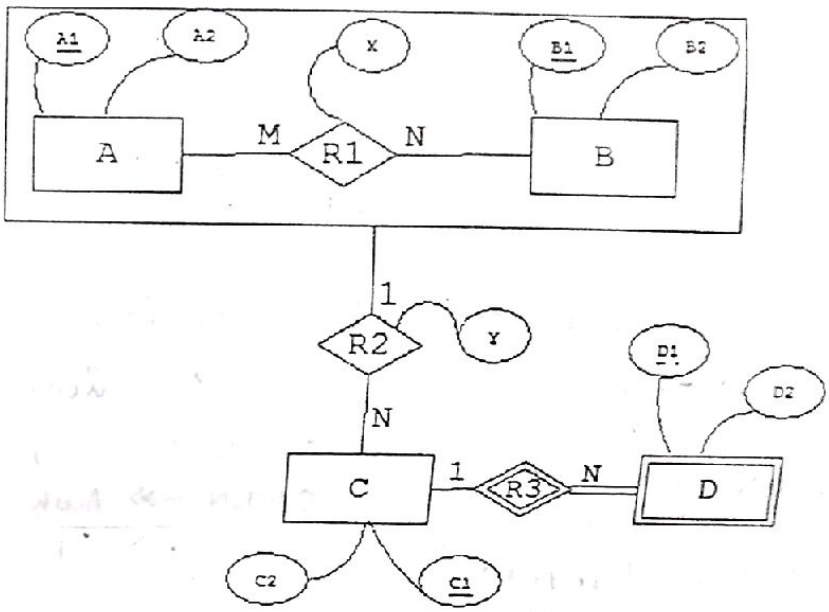
Time: 90 minutes

Max Points: 70

Your ID: 20150124 Name: Shubhangi Mehrotra.

IMPORTANT NOTE:
1. There are 4 pages in question paper, ensure that you have got all.
2. Answer questions in the space provide against the question itself. Overwriting is not allowed.
3. Write answers neat and clean. Answers that are difficult to read may simply be discarded.
4. In all questions marks awarding strategy will be discrete (i.e., 0, half, and full marks).

1. Consider ER Diagram given here, and do following [14]
   (a) Derive Relational schema from this ER diagram using ER to Relational mapping rules. Also indicate all keys and foreign keys.
   (b) Find out minimal FD set from semantics of attributes in given ER Diagram.
   (c) Indicate normal form of each derived relation in (a)



(14)

a) A (A1, A2) ✓
B (B1, B2) ✓
R1 (A1, B1, x) ✓
FK: A1 refers to A1 in A and B1 refers to B1 in B.
C (C1, C2, B1, A1, Y) ✓
FK: ~~B1 refers to B1 in~~ (A1, B1) refers to (A1, B1) in R1.
D (D1, C1, D2) ✓
FK: C1 refers to C1 in C.

(5)

(c) All the relations are in BCNF.

(2½)

b) Minimal FD set.
A1 → A2 ✓
B1 → B2. ✓
{A1, B1} → x ✓
C1 → C2. ✓
C1 → B1 ✓
C1 → A1 ✓
C1 → Y ✓
{C1, D1} → D2 ✓

2015011124 Shubhayu Mehrotra.

A

2. Again consider scenario of book database for an on-line store. Details of books are ISBN, Title, Price (consists of Currency, and Amount), Author-Name, Publisher-Name, Publisher-Address. You can assume publisher-name to be unique, and we record only one address of a publisher. A book has one (at least) or more authors, and published by exactly one publisher. ISBN is a universally unique number each book has. Some of books are reprinted by different publisher in some other country or region. In that case reprint of the book is given different ISBN, and will have different price in some other currency. However Title and author of book remain same as original print. Let us also maintain relationship of reprint with original publication.

[10+10]

Suppose all attributes here has been placed in a single universal relation
R(ORG-ISBN, Title, Currency, Price, Author-Name, Publisher-Name, Publisher-Address, Reprint-ISBN, Reprint-Currency, Reprint-Price, Reprint-Publisher-Name)

For compact representation, let us rename attribute of R as following
R(OISBN, TITLE, C, P, AUTH, PUB, PUBADD, RISBN, RC, RP, RPUB)

Task #1. Use your understanding of attributes in R here, and give minimum set of functional dependencies.

Minimal Set of Functional Dependencies.

OISBN → Title
OISBN → C
OISBN → Amount
OISBN → Pub
OISBN → PubAdd
OISBN →→ Auth
RISBN → RC
RISBN → RAmount
~~RISBN → RC~~
RISBN → RPub

Canonical Form

OISBN → {Title, C, Amount, Pub, PubAdd}
OISBN →→ Auth
RISBN → {RC, RAmount, RPub}

Key : {OISBN, RISBN}

Task #2. Using BCNF decomposition algorithm, derive normalized relations for the said database requirement. In the derivation, give only final and intermediate results, and do not give any textual descriptions.

On applying BCNF decomposition algo. R(...) decomposes to R1(...)

R1 (OISBN, Title, C, Amount, Pub, PubAdd, Auth) and

R2 (RISBN, RC, RAmount, RPub).

R2 is in BCNF.

R1 is in 4NF.

In-Semester Exam-IV (Autumn'2018)
IT 214 Database Management Systems

Max Points: 50

Time: 1 hour

Your ID: 201601056 Name: Maru Priyali

1	2a	2b	2c	2d	2e	3	4		
10	20					10	10		50

IMPORTANT NOTE:
1. There are 4 pages in question paper, ensure that you have got all.
2. Answer questions in the space provide against the question itself. **Overwriting is not allowed.**
3. Write answers neat and clean. Answers that are difficult to read may simply be discarded.
4. In all questions marks awarding strategy will be discrete (i.e., 0, half, and full marks)

1. Considering DA-ACAD database, write a "stored function" with following functionality. [10]

Input: AcadYr, Semester, StudentID
Output: returns total credits taken by the student
Note: do not use any aggregate operations.

```
CREATE OR REPLACE FUNCTION total_credits (Acadyr ~~DATE~~ integer(4), Semeste
        integer(5), studentID integer(10))
RETURNS integer AS $BODY$
DECLARE
 stud registers%ROWTYPE;                cr integer(10) := 0;
 coure-taken registers%ROWTYPE;         sum-credit (~~real~~) integer(1000) := 0;
BEGIN
   FOR stud IN SELECT * FROM Registers where year='Acadyr
   loop                                  and, semester = Semesters and
                                         SID = student ID
      FOR course-taken IN SELECT * FROM Register
      loop                              where year='Acadyear' and semester = Semester
                                        and SID = StudentID
         SELECT credit into cr FROM courses where
                                        courseno = courseTaken.courseno
         sum-credit := sum_credit + cr;
      end loop
   end loop
RETURN sum-credit;
END
$BODY$ LANGUAGE 'pgpsql';
```

10

2. In next question you are given a number of relations and FDs over them. You need to do following for each relation -
   a. Compute key(s)
   b. Determine highest normal form of the relation (consider only up-to 4NF)
   c. Name all FDs that "violate the requirement" of the relation being in next higher normal form. If a relation is already in 4NF you have answer "NONE" here.
   d. Give 4NF Normalized relations. Make sure that decomposition is lossless and FD preserving. If you cannot decompose due to any loss, mention the same. Also underline key attributes of each normalized relation.

5x4=20

R(ABCDE)F A → B B → CDE DE → F	Key: A	Normal Form: 2NF	Culprit FD: B → CDE, DE → F
4	Normalized Relations: R1{DEF} R2{BA} R3{BCDE}		
R(ABCDEFH) ABC → DEF AB → CGH	Key: AB	Normal Form: 4NF	Culprit FD: None
4	Normalized Relations		
R(ABCDE) A → BCDE E -->> ABCD	Key: A	Normal Form: 4NF	Culprit FD: None
4	Normalized Relations		
R(ABCD) A → B BC → D A → C	Key: A	Normal Form: 2NF	Culprit FD: BC → D
4	Normalized Relations: R1{ABC} R2{BCD}		
R(ABCDE) A → BC CD → E B → D E → A	Key: A	Normal Form: 2NF	Culprit FD: CD → E, B → D, E → A
4	Normalized Relations By BCNF and 4NF decomposition, there is loss of FD CE → A Relations : (CDE), (ABC), (BD) Hence by 3NF decomposition we get {ABC} {CDE} {BD} {EA}		

Your ID: 20160165 Name: Hari Pranjali

For preparing time table of courses (let us say only for lectures), there is a notion of time slot. Each slot will have start time and end time for each scheduled day. For example there is slot A that has lecture on Monday 9-10AM, Wednesday 10-11AM, and Thursday 9-10AM.

All offered courses are assigned a slot. No two courses of an instructor are assigned same time slot. Assume that all courses are of three credits.

Each course offering is assigned a faculty. Each slot for a course is assigned a room. There is possibility that lectures of a course can be allocated different rooms on different days - for example room for lectures of your IT214 can be assigned as following – Monday and Wednesday in LT-1 and Thursday in LT-3. Obviously no two courses are assigned same room in a slot on a day.

Also a staff is delegated to take attendance. There can be different staff in a room on different days (not date). We also record seating capacity of a room.

For simplicity ignore academic year and semester. Assume that all data are for current semester.

Answer next two questions based on this description-

10+10

3. Based on semantics of attributes, enumerate minimal FD set for the database.

courseNo → credit
courseNo → instructor(faculty)ID
RoomNO → seating-capacity
courseNO → slotID
slotID → RoomNO
facultyID → facultyIDname
slotID → Day
slotID → Start_time
slotID → End-time
RoomID → staffID
staffID → staffName

10

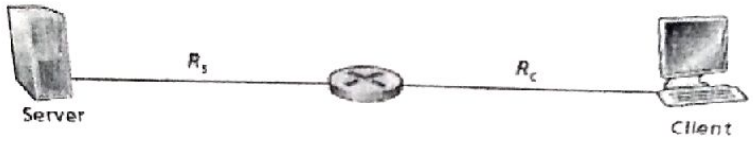
Dhirubhai Ambani Institute of Information & Communication Technology
Mid Semester Test-1, 1st Semester 2017- 18

Course Title	IT304 Computer Networks		**Max Marks**	15
Date	1 September 2017	**CLOSED BOOK**	**Time**	1 Hour

In protocol design problems,

- Assume that all the nodes run the required application components.
- Give a brief description of how your protocol functions.
- Provide the details of the message structure, message sequence, timer functions (if needed), and other actions performed by the nodes.
- Give brief justification for each component of your design.

1. Assume that the resolving name-server is running on DAIICT network and there is an *iterative* DNS server at each domain level. Draw the relevant DNS hierarchy and list the DNS messages sent and received and records processed in obtaining the IP address corresponding to "mail.cse.mit.edu". [4]



2. Assume that we know the bottleneck link along the path from the server to the client is the first link with rate R_s bits/sec. Suppose we send a pair of packets back to back from the server to the client, and there is no other traffic on this path. Assume each packet of size L bits, and both links have the same propagation delay d_{prop}.
   a. What is the packet inter-arrival time at the destination? That is, how much time elapses from when the last bit of the first packet arrives until the last bit of the second packet arrives?
   b. Now assume that the second link is the bottleneck link (i.e., $R_c < R_s$). Is it possible that the second packet queues at the input queue of the second link? Explain. Now suppose that the server sends the second packet T seconds after sending the first packet. How large must T be to ensure no queuing before the second link? Explain. [4]

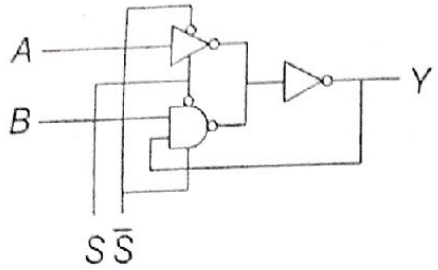
3. On a LAN server, a ToD (time of day) application runs that periodically (at interval D) broadcasts the time to all the nodes connected on the LAN. A node, on booting, however, can ask for the ToD server to send the time immediately. ToD server responds with a single message, even if multiple requests come within time interval **d**. Design the protocol specifying the functionalities, message structure, actions, and syntax. [7]

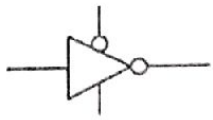
Registration Nos .....

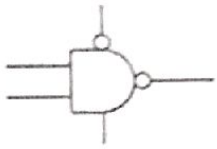
EL203: Embedded Hardware Design
DA-IICT, Gandhinagar
Nov 30, 2018 (Friday)...Exam: Final
Duration: 120 minutes (Time: 1430hrs-1630hrs) Total Marks: 100

[5 marks]

1. Identify the following circuits:







2. a. Provide a state diagram and state output table of the Mealy machine which implements the followi behavior:

$$z(t) = \begin{cases} x'(t) & if\ x(t) = 0\ and\ x(k) = 0\ for\ all\ k < t \\ 0 & if\ x(t) = 1\ and\ x(k) = 0\ for\ all\ k < t \\ x(t) & otherwise \end{cases}$$

[10 marks]

b. Illustrate the time behavior for the input sequence shown below. [10 marks]

Assume $x(k) = 0\ for\ k < 0$

t	0	1	2	3	4	5	6
x(t)	0	0	1	0	1	1	0
z(t)							

3.

a. A modulo 6, synchronous binary counter cycles through the states 000_2 to 101_2 and then repeats the sequence. Design a synchronous sequential circuit that implements the counter, using D-type flip-flops and logic gates. [12 marks]

b. Show how the counter you designed can be used to write incoming synchronous data into a RAM device. Assume the RAM has 3 bits of address and is 1 byte per address. A clock signal on the input shows valid data on the rising edge. Your RAM should store the last 6 bytes of the data. [8 marks]

Registration Nos .....

4. Find an equivalent finite state machine with a minimum number of states. Show all the steps while reaching to the minimal state table. Design the circuit using appropriate combinational and sequential elements.

[20 marks]

PS	x=0	x=1
A	E,0	C,0
B	C,0	A,0
C	B,0	G,0
D	G,0	A,0
E	F,1	B,0
F	E,0	D,0
G	D,0	G,0

5. *A synchronous counter has the following counting sequence*

$$0 \rightarrow 1 \rightarrow 3 \rightarrow 2 \rightarrow 6 \rightarrow 7 \rightarrow 5 \rightarrow 4 \rightarrow 0$$

The outputs are interpreted as binary integers.

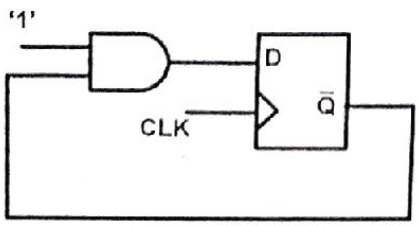
a. *Produce the next state equations such that the counter is hazard-free.* [6 marks]

b. Using positive-edge D-type bistables and only 2-input NAND gates, sketch the circuit diagram of the above counter. [4 marks]

c. Given that, a D-type bistable has T_{PHL}= *12 ns*, T_{PLH}= *10 ns*, T_{SU} = *2 ns*, and a 2-input *NAND gate has* propagation delay of *4 ns*, estimate the maximum clock frequency at which the above counter could operate. [6 marks]

d. Describe one way by which the counter could be initialized to count from a specified count value. [4 marks]

6. The following circuit aims to provide an output **Q** whose frequency is *15MHz* when the clock (CLK) frequency is *30 MHz*.



For a D-type bistable, T_{SU} = *10 ns*, T_H = *2 ns*, and T_{PHL} = T_{PLH} = *13 ns*. For the AND gate T_{PHL} = T_{PLH} = *12 ns*. Explain what happens in the clock cycle immediately following a rising edge. Will the circuit satisfy its aims? [15 marks]

-END OF PAPER-

CNs insem 2

Dhirubhai Ambani Institute of Information & Communication Technology
Mid Semester Test-2, 1st Semester 2017- 18

Course Title	IT304 Computer Networks		**Max Marks**	25
Date	12 October 2017	**CLOSED BOOK**	**Time**	90 min

1. In the context of a reliable link-layer protocol
   a. Define the efficiency of the protocol.
   b. Compute the efficiency of GBN and SR for a noisy link with constant RTT.
   c. What is the optimal window size and maximum sequence number for each of these protocols? [1+4+1]

2. A transport layer congestion control protocol like TCP relies only on the information contained in ACK feedback received from the receiver along with estimating packet timeout timer.
   a. Describe the TCP timeout timer estimation for each packet.
   b. Describe how the packet timeout may be used to manage congestion.
   c. Describe how the RTT values of the ACK may be used to manage congestion.
   d. Under appropriate assumptions, show that the dependency of expected throughput on **RTT** and packet loss probability **p**. *[2+2+2+3]*

3. A node can use an *echo* packet to find the round-trip-delay to its direct neighbors. Let's define the weight of a link between neighbor nodes A and B as $W_{AB} = W_{BA} = (RTT_{AB} + RTT_{BA})/2$.
   a. Design this *echo* protocol to compute W_{AB}.
   b. Design a protocol that uses repeated communication between direct neighbors to find the shortest path between any pair of nodes in the network. [2+3]

4. A UDP socket application typically needs to build flow-control logic within the application itself. This requires, among other things, implementing sliding window operations (buffer management, packet sequencing), and retransmissions.
   Using a combination of socket library functions and system calls, provide a pseudocode skeleton for implementing these. Detailed code is not required but familiarity with the function and system calls signature and their usage is expected. [5]

CNS endsem

DA-IICT **Dhirubhai Ambani Institute of Information & Communication Technology**
Final Examination, Semester I 2017-18

Course Title	IT304 Computer Networks	PART-B	**Max Marks**	30%
Date	30 November 2017	CLOSED BOOK	**Time**	2 Hours

All questions carry 5 marks each.

1. A TCP sender is transmitting data to a receiver. The initial congestion window size is 2KB and the threshold is 16KB. Maximum segment size is 64KB. The first 4 RTT value measured by the sender are (in milliseconds) [400, 300, 900, 100].
   a. What is the congestion window size after the 4 successive ACKs are received?
   b. Assuming the smoothing parameter (weight given to old value) $\alpha = 0.9$, what is the estimated RTT for the next packet sent?
   c. What is the value of the Timeout Timer? $\beta = 0.2$

2. An organization has some 500 nodes in its network divided into 3 segments. This can be done by sub-netting one class B address block. Using specific addresses explain the subnetting mechanism. How does routing between subnets take place?

3. Using clear examples, briefly explain how DHCP, NAT, and CIDR help in more efficient use of the Internet address space.

4. Explain how tunneling is used to allow incremental deployment of IPv6 and co-existence of IPv4 and IPv6?

5. What are switching element and switching fabric? Draw the schematic of an 8x8 Banyan switch. Using an example, show that Banyan design leads to internal blocking?

6. In the context of IEEE 802.3 (Ethernet) LAN protocol, answer the following:
   a. Derive an expression for the maximum length L_{max} of a LAN as a function of relevant LAN parameters (e.g. link capacity C, min packet size P_{min}, max packet size P_{max}, propagation speed V etc.)
   b. Explain the need of exponential back-off mechanism in 1-presistent CSMA/CD.

L_{max}

8
2 2T6

cw = 2 kB
Th. = 16kB

Registration Nos 201601056

DA-IICT, Gandhinagar
EL203: Embedded Hardware Design
Oct 15, 2018 (Monday)...Exam: Insem2
Duration: 60 minutes (Time: 1630hrs-1730hrs)
Total Marks: 50

No Calculators allowed.

1. Design a combinational network that finds the largest and the second largest of four nonnegative integers A, B, C, D. Each integer is represented by four bits. You may use one of the following module types: 4x2 input muxes and 4 bit comparators. The two bit output of the comparator is z = (z_1, z_0). If the first integer is larger than the second, the output is z= 10. If the second number is larger, the output is z=01 and if the numbers are equal, the output is z=00. Indicate all the inputs and connections and the modules being used.

[15 marks]

2. a. Complete the following table. If there is a problem completing the table, explain. All implicit and explicit values are given in the decimal number system. [6 marks]

Number System	Number of digits n	Signed integer x	Representation value x_R	Digit vector X
2's complement	7	-39	103	1 1 0 0 1 1 1
1's complement	8		167	
2's complement				100100100
2's complement	6	-43		

b. Compute $z=a+2b-c$ in 2's complement for $a=-7$, $b=12$, and $c=-97$. Perform calculations on bits representing a, b, and c and show every step of your work. How many bits should z have to represent the correct result? Check your work by showing, for each step, the corresponding values in decimal number system. [4 marks]

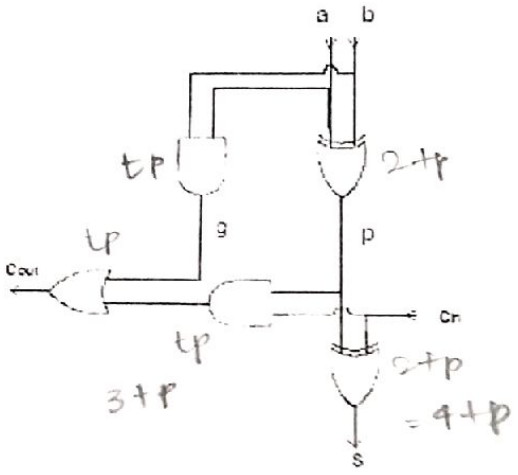
3. Design a 4-bit by 2-bit multiplier module. The operands are positive: the multiplicand X=(x_3, x_2, x_1, x_0), the multiplier Y= (y_1, y_0) and the product p = (p_5, p_4, p_3, p_2, p_1, p_0). You are allowed to use AND gates, full adders (FA) and half adders (HA) **only**.

[15 marks]

CNS endsem

Registration Nos .2016010S6.....

4. Calculate the worst case delay of a Ripple carry adder consisting of the full adder blocks shown below. You can use t_p for the AND and OR functions and $2t_p$ for the XOR gates. Express your answer in terms of t_p.



Repeat the same calculations for 32-bit adders. **[10 marks]**

-END OF PAPER-

In-Semester Test-2
IT 214 Database Management Systems

Time: 90 minutes

Max Points: 80

IMPORTANT NOTE

1. Write answers neat and clean. Answers that are difficult to read may simply be discarded.
2. Answer all queries in order. If you want to defer answering a query, may move to next by leaving sufficient blank space. You may follow a strategy of not answering more than two queries on a page.
3. Each query is for 10 points, and awarding strategy will be discrete (i.e., 0, 5, and 10).
4. You may have to pay penalty for lengthier query expressions.
5. All queries are to be answered in **Relational Algebra**. No marks will be awarded if answered in SQL.

1. Given below is relational schema extended version of schema **DA-Acad** (discussed in lectures and used in labs). While extending it, names and meaning of original relations and attributes is retained.

Student(StudetID, StdName, ProgID, Batch, CPI)
Course(CourseNo, CourseName, Credit)
Faculty(FacultyID, FacultyName)
Offers(AcadYear, Semester, CourseNo, FacultyID, Grade_Submitted_Flag)
//Attribute "Grade_Submitted_Flag" is used to store grade submission status of a course offer
//FK: CourseNo refers to Course(CourseNo)
//FK: FacultyID refers to Faculty(FacultyID)
Registers(StudetID, AcadYear, Semester, CourseNo, grade)
//for better machine interpretability, let us store grades *in numeric form, i.e. 10, 8, and so.*
//FK: StudetID refers to Student (StudetID)
//FK: (AcadYear, Semester, CourseNo) refers to Offers
SemesterResult(StudetID, AcadYear, Semester, SPI, CPI)
//FK: StudetID refers to Student (StudetID)
HoR_Wing(wing, gender)
//wing attribute identifies a HoR wing, and draws value from alphabets A to J.
//wings are reserved for a specific gender 'M' or 'F', however assume that
// a wing can be assigned to other gender anytime.
HoR_Room(rno, wing, floor)
//FK: wing refers to HoR_Wing
//floor is labeled as 1 for ground, 2 for first, and 3 for second floor.
//to be informative to human users, attribute rno draws value from pattern
// "<wing><floor><number>", for example rno C110, indicates that it is in
// C wing, ground floor, and number is 10.
Allot(sid, rno)
//FK: sid refers to **student**
//All room allotments are recorded in this relation.
// the relation also has **NOT NULL** constraint for attribute **rno**.
// A students whose sid does not appear in this relation indicates that
student does not reside in HoR.

Pass.

Student (82) exempt

Using given relational schema, write relational algebra expressions for following queries-

1. Report (CourseNo, FacultyName) who have not submitted grades for semester 'Autumn', 2016.
2. Report (StudentID) who have got more than two F (i.e. zero) grade in 'Winter', 2016.
3. Report (Faculty-Name) who have taught more than three courses in academic year, 2015-16.
4. Report (StudentID, Student-Name, Grade) of students who are residing in C second floor and took course IT633 in 'Autumn', 2015.
5. Report (StudentID, Student-Name) of M Tech 2015 (progid=11) residing in HoR (Man).
6. Report (StudentID, CourseNo) backlogs* for B Tech ICT (progod = '01') batch 2012.

---

*Let us define backlog as a set of courses that a student has taken ever MINUS set of courses student has got pass grade (i.e. not zero) . Also account for that a student takes a course, let us say IT123, got zero grade in first attempt, and got pass grade in second (or even third) attempt.

7. Report (StudentID, Student-Name, CPI) that have scored more 7.0 grade in all of the courses given here {IT110, IT214, IT205, SC215, IT314, IT301}.
8. Report (CourseNo, FacultyName) for courses offered since 'Autumn', 2010 in which more than 50% students got grade got more than 7.0.

Second in-Semester Examination, Autumn 2015
IT 615 Database Management Systems

Time: 90 minutes

Max Points: 50

IMPORTANT NOTE: Write answers neat and clean. May be you can first work in rough area and write final version as answer. Answers that are difficult to read may simply be ignored.

1. Convert following SQL queries to relational algebra

[3x5]

a.
```
SELECT * FROM EMPLOYEE AS e1 WHERE e1.SALARY > (SELECT
SALARY FROM EMPLOYEE AS e2 WHERE e2.SSN = e1.SUPERSSN);
```

b.
```
SELECT * FROM r1 WHERE
(a1,a2,a3) IN (SELECT (b2,b5,b7) FROM r2);
```
//do not use SEMI JOIN

c.
```
SELECT ssn2, count(ssn1) FROM (SELECT e1.ssn as ssn1,
e2.ssn as ssn2 FROM EMPLOYEE AS e1 JOIN EMPLOYEE as e2 ON
(e1.superssn=e2.ssn)) as r1
GROUP by ssn2 HAVING count(ssn1) > 2;
```

2. Consider following schema. Answers queries given below in **Relational Algebra**.
[All queries approx carry equal weightage.]

[5x7]

`DEP(dno, dname, head_eno)`
-- attribute `head_eno` is emp no of the head of the department
-- and refers into EMP relation
`EMP(eno, name, gender, cat, super_eno, dno)`
-- attribute `super_eno` is emp no of the employee's supervisor
-- and refers to `eno` of EMP itself.
-- attribute `cat` is employee category and has domain of {worker, manager, engineer, staff}
`PROJ(pno, pname, dno)`
-- attribute `dno` is FK referring into DEP relation
`WORK_HOURS(eno, pno, hours_per_month)`
-- Attributes `eno` and `pno` are FKs referring into EMP and PROJ respectively.

a. Suppose there is a rule in the company that employees that are of manager category can only be head of a department. Write query expression that checks if there is any head who is not manager.
b. Compute Average salary for each category of employees.
c. Compute total salary for each employee category for each department.

Suppose workers are paid an extra incentive on top of salary at the rate of Rs. 50 per month per hour. Note that incentive is paid to workers only and applicable to next two queries only.

d. Find out total incentive each department has to pay every month. Note that incentive is paid by the department by which the project is managed.
e. Due to incentive scheme, some workers may get salary more than their supervisors. Produce list (eno, name, salary including incentive) of such workers.

Time: 60 Minutes

Max Points: 60

IMPORTANT NOTE:

1. Write answers neat and clean. May be you can first work in rough area and write final version as answer. Answers that are difficult to read may simply be ignored.
2. In Algebra do not use semi-difference and semi join operations, and In SQL do not perform join through cross product.
3. All queries carry equal marks and there will be no partial marking

1. Given relation schema R(x,y,z), and S(z,a,b), convert following Relational Algebra expressions into SQL: $R \div \Pi_z(S)$ [10]

```
SELECT * FROM R
WHERE NOT EXISTS (
   ( SELECT z FROM S )
    EXCEPT
   ( SELECT z FROM R AS r1
       WHERE r1.x = r.x and r1.y = r.y)
);
```

OR

```
SELECT * FROM R
WHERE x, y not in (
SELECT x, y FROM
   (SELECT x, y, z FROM
         (SELECT x, y FROM S) AS r1, (SELECT z FROM S) AS s1
   EXCEPT
   (SELECT x, y, z FROM R)) AS r
);
```

2. Consider following schema for Halls of Residence, and write algebraic expressions for following queries [7+7+4x9]

```
STUDENT(id, name, email, prog_code, batch, cpi)
ROOM(rno, wing, floor)
ALLOT(sid, rno)
HMC(wing, floor, sid)
```

i. List Rooms (RooNo, Floor, Wing) that are vacant.

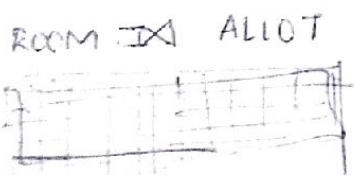
ii. List Rooms (RooNo, Floor, Wing) that are having single occupancy.

iii. Give Floor wise (Wing and Floor) count of vacant positions, i.e. number of students can be accommodated on each floor. Considering that rooms are double seated.

iv. Give Wing wise distribution of M.Sc.(IT) students (any batch), that is how many students are residing in each wing.

v. List Floors (wing and Floor) that are not having HMC representatives.

vi. List Floors in which 20 or more students are residing from a single batch of a program.



In-Semester Exam-II (Autumn'2017)

IT 214 Database Management Systems

Time: 80 minutes

Max Points: 80

IMPORTANT NOTE:

1. Write answers neat and clean. Answers that are difficult to read may simply be discarded.
2. Answer all queries in order. If you want to defer answering a query, may move to next by leaving sufficient blank space. You may follow a strategy of not answering more than two queries on a page.
3. In all questions marks awarding strategy will be discrete (i.e., 0, half, and full marks).
4. You may have to pay penalty for lengthier solutions.

Consider relational schema given below, and write relational algebra expressions for following queries (NO SQL)-

Student(StudetID, StdName, ProgID, Batch, CPI)
Course(CourseNo, CourseName, Credit)
Faculty(FacultyID, FacultyName)
Offers(AcadYear, Semester, CourseNo, FacultyID)
Registers(StudetID, AcadYear, Semester, CourseNo, grade)
HoR_Room(rno, wing, floor)
Allot(sid, rno)
SBG(sid, **Committee, Role**)
-- **sid** is student id of sbg member, and role can be like convener, or member, committee is name of committee like "CMC", or Cultural, or so

[6x10]

1. List CourseNo, Number_of_Registrations, Faculty_Name for course offering (in term Autumn'2017) where number of registrations are less than 10.
2. List of ID and Name of students from B.Tech. (progid='01') and 2015 batch who do not reside in HOR.
3. List Room Nos' along with ID and Name of resident that are singly occupied.
4. List ID, Name, and Role of all members of "Cultural" committee who are residing in J and K wings.
5. Report (StudentID, Student-Name, Grade) of students who are residing in C wing, progid='01' and took course IT633 (in Autumn'16) and passed with grade >= 7.0.
6. Report (StudentID, Student-Name, CPI) that have scored more than 7.0 grade in all of the courses given here {IT110, IT214, IT205, SC215, IT314, IT301}.
7. Consider maintaining database of books (let us say by an on-line book-store) with details of ISBN, Title, Price (consists of Currency, and Amount), Author-Name, Publisher-Name, Publisher-Address. A book has one (at least) or more authors, and published by exactly one publisher. ISBN is a universally unique number each book has. Some of books are reprinted by different publisher in some other country or region. In that case reprint of the book is given different ISBN, and will have different price in some other currency. Let us also maintain relationship of reprint with original publication.

   Draw ER Diagram for the said database requirement. Do not add any additional attribute from your own, unless you have proper justification.

   [20]

End Semester Examination (Autumn'2018)
IT 214 Database Management Systems

A

Student ID: 201601056 Name: Hasu Pradyot

Time: 90 minutes Max Points: 115

IMPORTANT NOTE:
1. There are six pages make sure that you have them all in your set.
2. You need to answer all questions in question paper itself.
3. Write answers neat and clean. Over-writing is not allowed.

79

Marks								
1	2	3	4	5	6	7	8	9
7½	18	0	12	5	5	7	4.5	20

1. Tick the correct option (there can be multiple options be correct; check them all) – [10]

½ i. Heap files are roughly good for operations <INSERT/DELETE/SEARCH>

½ ii. Secondary index can be <dense/clustered/b+-tree/sparse>

½ iii. Participation of a weak entity with identifying relationship is always total [True/False]

1 iv. Materialized view hold data <true/false> _____

If yes, what data? Data of view operators (Result of queries)

1 v. Unbound cursor can be bound with dynamic query <Yes/No>

2 vi. TP_OP is a <implicit local variable/implicit parameter variable/global variable/ no such variable>

2 vii. Embedded SQL provides an environment in which SQL statements are sent to DBMS for execution <Yes/No/both-depends on configuration>

1 viii. Using "CREATE ASSERTION", we can create constraints that span to multiple tables <True/False/No such command>

½ ix. In case of B+-tree based index, index scan mean "sequential scan of leaf nodes" <True/False/No such operation>

½ x. Bloated index refers to index having <too much void spaces in blocks/ too much overflow/index corrupted /all of these>

[30]

2. Fill in the blanks-

i. Referential Integrity constraint requires that referenced key should be primary key

ii. Prepared statement helps in _____

iii. Entity Integrity constraint requires that _____

iv. `CallableStatement` object in JDBC is used for _____

v. Which property of schedule ensures **Isolation** serialization

vi. Which property of schedule ensures **Atomicity** Recoverability

vii. Which property of schedule ensures **Durability** Recoverability

viii. Weak entity is the one that is derived from strong entity

ix. Which SQL Isolation level may cause Dirty Read Read uncommitted

x. Advantage of strict 2PL over standard 2PL concurrency

xi. System logs helps in durability and atomicity

xii. Write Ahead Logging Protocol is used for Recovery

xiii. Noted problem in basic Snapshot Isolation is skew write

xiv. Main problem in 2PL protocol is deadlocks

xv. Main problem with basic time stamp ordering techniques is concurrency

xvi. What is the name of technique that is used for avoiding cascaded rollbacks
recoverable principle

xvii. What is highest SQL isolation level that has Phantom row problem Repeatable read

xviii. One of the most important advantage of sql views is
Abstraction

xix. Name one of the procedural data manipulation language
Embedded SQL, C

xx. Can you determine Normal form of relation R(AB), in absence of FD information. Note that, no information does not mean NO FD; if yes what is NF? NO

3. Consider following keys; Primary Key(PK), Key(K), Candidate Key(CK), Super Key (SK), and choose which symbols is most appropriate to be placed in the blank space (⊆ or ⊇ or =) below. [5]

i. PK ⊆ K 2

ii. PK ⊆ CK 2

iii. CK ⊆ K 2

iv. CK ⊇ SK 2

v. K ⊇ SK 2

4. Give short answers -

i. Suppose Employee relation has B+-tree index on DNO. Compute approximately execution cost of query "SELECT * FROM EMPLOYEE WHERE DNO=5"? May express in terms number of block read/writes, and assume other parameters! [3]

3 let the height of B+ tree be H.
since DNO is not PK. execution cost
cost = H + S (S = selectivity = $\frac{N}{\text{distinct no attribute}}$

ii. Suppose you have following query to be executed
$\sigma_{SALARY>30000 \wedge DNO=5}(EMPLOYEE)$
What could be best strategy to execute this query. [3]

3 index by DNO (in B+ tree), here any formula could be applied such as H+1 (H = height).
After that do linear scan for salary.

iii. Compute Join selectivity of join EMPLOYEE JOIN DEPARTMENT ON DNO. What is "Join Selectivity" of the JOIN? May assume other parameters [3]

join selectivity $js = \frac{|R \text{ JOIN } S|}{|R \text{ CROSSJOIN } S|}$

3 for EMP ⋈ DEP
e.dno = d.dno
$js \leq \frac{|E|}{|E||D|}$ $js \leq \frac{1}{|D|}$ if there are non NULL values $js = \frac{1}{|D|}$ [3]

iv. Translate following SQL query in terms of relational algebra:

```
SELECT * FROM EMPLOYEE WHERE SSN IN
        (SELECT DISTINCT ESSN FROM DEPENDENT)
```

0 $\pi_1 \leftarrow \sigma_{essn}(dependent)$
$\pi_2 \leftarrow \sigma_{*}(employee \bowtie \pi_1)$
e.ssn = π_1.essn.

v. Consider relation R(A, B, C) and set of FDs { {A → B}, {B → C}}; can you find out a join dependency here. [3]

yes there is a join dependency here.
{A→B, B→C} this will give A→C

vi. Given, A → B and XB → C, prove that XA → C. [3]

A → B (given)
XA → XB (Augmentation Rule) (1)
XB → C (given) (2)
From (1) and (2) by transitivity,
XA → C

✓3

vii. Suppose following schedule is executed by interleaving operations from transactions T1 and T2. What kind of concurrency problem do you see in following schedule? Give short reason. [5]

```
T1: Read X
T1: X = X + 50
T1: Write X
T2: Read X
T2: X = X + 100
T2: Write X
T1: Abort
T2: Commit
```

$R_1(X)$ $W_2(X)$
$W_1(X)$ $W_2(X)$
$W_1(X)$ $R_2(X)$

Here T1 updates the value of x. It has not yet committed. T2 reads the value of x and updates it. Now T1 will aborts (it will roll back the value). T2 already committed. (It made update on new value of x which is wrong) This type of concurrency problem is Dirty Read which happens because of Read Uncommitted isolation level

✓5

viii. Is the schedule given in previous question is recoverable? Give short reason. [5]

The above schedule is not recoverable. Transaction T2 reads from T1 which has not yet committed. It is against the Recoverability principle

Recoverable principle state that a transaction must not commit until and unless the transaction from which it is reading gets committed. Here it is not followed, Hence schedule is not recoverable

✓5

7. Consider the three transactions T1, T2, and T3, and the schedules S1 and S2 given below. Draw the serializability (precedence) graphs for S1 and S2, and state whether each schedule is serializable or not. If a schedule is serializable, write down the equivalent serial schedule(s).

[10]

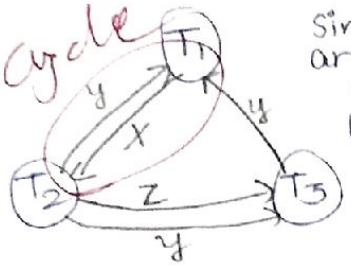
S1: r2(Z); r2(Y); w2(Y); r3(Y); r3(Z); r1(X); w1(X); w3(Y); w3(Z); r2(X); r1(Y); w1(Y); w2(X);

conflicting operations:

$r_2(z)$	$w_3(z)$	$w_2(y)$	$r_1(y)$
$r_2(y)$	$w_3(y)$	$w_2(y)$	$w_1(y)$
$r_2(y)$	$w_1(y)$	$r_3(y)$	$w_1(y)$
$w_2(y)$	$r_3(y)$	$r_3(z)$	
$w_2(y)$	$w_3(y)$	$r_1(x)$	$w_2(x)$
$w_3(y)$	$r_1(y)$	$w_1(x)$	$w_2(x)$
$w_3(y)$	$r_1(y)$	$w_1(x)$	$r_2(x)$

(7)

cycle



(2)

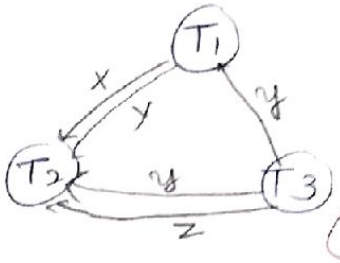
Since there are no cycles formed. S1 is serializable ✓

eq. serial schedule : T2 : T3 : T1

S2: r3(Y), r3(Z), r1(X), w1(X), w3(Y), w3(Z), r2(Y), r1(Y), w1(Y), r2(Y), w2(Y), r2(X), w2(X),

conflicting operations:

$r_3(y)$	$w_1(y)$	$w_3(y)$	$w_1(y)$
$r_3(y)$	$w_2(y)$	$w_3(y)$	$r_2(y)$
$r_3(z)$		$w_3(y)$	$w_2(y)$
$r_1(x)$	$w_2(x)$	$w_3(z)$	$r_2(z)$
$w_1(x)$	$r_2(x)$	$r_1(y)$	$w_2(y)$
$w_1(y)$	$w_2(y)$	$w_1(y)$	$r_2(y)$
$w_3(y)$	$r_1(y)$	$w_1(y)$	$w_2(y)$



No cycles formed, S2 is serializable

(5)

serial schedule : T3 T1 T2

8. Consider following schedule executed on PostgreSQL. Assume that initial salary for employee with SSN 123 is 50000. [Here labels T1 and T2 against statements indicate Transaction that is issuing the statement.] What will be shown by SELECT statements at line numbers 3, 5, 7, 10 if transaction T2 is specified to execute at READ COMMITTED isolation level and SERIALIZABLE isolation level?

[6+6]

```
1  T1: begin;
2  T1: update employee set salary = salary+3000 where ssn = 123;
3  T1: select salary from employee where ssn = 123;
4  T2: begin;
5  T2: select salary from employee where ssn = 123;
6  T2: update employee set salary=salary+5000 where ssn = 123;
7  T2: select salary from employee where ssn = 123;
8  T1: commit;
9  T2: commit;
10 T1: select salary from employee where ssn = 123;
```

(4½)

READ COMMITTED level		SERIALIZABLE level	
Line 3:	50000 ✗	Line 3:	50000 ✗
Line 5:	53000 ✗	Line 5:	– ✗
Line 7:	53000 ✗	Line 7:	– ✓
Line 10:	58000 ✓	Line 10:	53000 ✓

20160105L Name Pranjali

9. Suppose following attributes are drawn from a sales/purchase system of trading company.

`Sales_bill_no, sales_bill_date, customer_no, customer_name, item_no, item_name, quantity_in_stock, quantity_in_bill, item_rate, item_rate_in_bill, item_category, item_category_sales_tax_rate, supplier_id, supplier_name, purchase_bill_no, purchase_bill_date, quantity_in_purchase_bill, item_rate_in_purchase_bill, average_purchase_price`

Assume that: (1) there is only one supplier for each ~~item~~ purchase bill, (2) an item comes only once in a bill (3) there is only one customer for a sales bill (4) sales tax rate in a bill depends on item category (5) a sales bill contains all items of same category.

Your tasks here are following - [10+10]

i Identify Minimal FD Set

ii. Give normalized relations that are in BCNF. Specify Keys and FKs also.

FDs

sales_bill_no → sales_bill_date

sales_bill_no → customer_no

customer_no → customer_name

sales_bill_no → item_no

item_no → item_name, item_rate

item_no → quantity_in_stock, ~~quantity_in_bill~~

{sales_bill_no, item_no} → quantity_in_bill, item_rate_in_bill

item_no → item_category (1e)

item_category → item_category_sales_tax_rate

supplier_id → supplier_name

purchase_bill_no → purchase_bill_date, quantity_in_pur_bill

{purchase_bill_no, item_no} → item_rate_in_purchase_bill

{quantity_in_purchase_bill, item_rate_in_pb} → average_purchase_price

Relations

sales_bill_no → {sales_bill_date, customer_no, item_no}

customer_no → {customer_name}

item_no → {item_name, item_rate, quantity_in_stock, item_category}

(1e) supplier_id → {supplier_name}

purchase_bill_no → {purchase_bill_date, quantity_in_purchase_bill}

{sales_bill_no, item_no} → {quantity_in_bill, item_rate_in_bill}

{purchase_bill_no, item_no} → item_rate_in_purchase_bill

{quantity_in_purchase_bill, item_rate_in_pb} → avg_purchase_price

underlined attributes are keys

READ THE INSTRUCTIONS CAREFULLY

DA-IICT, Gandhinagar
EL2xx: Embedded Hardware Design
Aug 31, 2018 (Friday)
Exam: Insem1
Duration: 60 minutes (Time: 1100hrs-1200hrs)
Total Marks: 50

Keep the rough workings along side your solution.
No Calculators allowed.
No extra sheet provided.

1. Show how a demultiplexer could be used to allow a microcontroller to control eight LEDs from three digital outputs.
(8 marks)

2. Implement the function

$$f = \sum_{ABC}(1,3,4,7)$$

using a 4-1 line multiplexer and a NOT gate, and
using a 3-1 line decoder and an OR gate.
Describe the commonality between the two implementations.
(10 marks)

3. Design a combinational logic circuit which subtracts 1 from the input. Given a 3-bit binary input ABC_2, design a circuit which provides a 3-bit binary output DEF_2. Where

$DEF_2 = ABC_2 - 1$ if $ABC_2 > 0$
$= 0$ if $ABC_2 = 0$

(12 marks)

4. Apply Quine McCluskey method on the following expression:

$$X = \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}CD + \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D + A\bar{B}C\bar{D} + AB\bar{C}\bar{D} + AB\bar{C}D + ABCD$$

And write the reduced solution.
(20 marks)

-END OF PAPER-

Dhirubhai Ambani Institute of Information & Communication Technology
Mid Semester Test-1, 1st Semester 2018- 19

Course Title: IT304 Computer Networks | Max Marks: 20
Date: 1 September 2018 | CLOSED BOOK | Time: 1 ½ Hour

In protocol design problems,

- Give a brief description of how your protocol functions
- Provide the details of the message structure, message sequence, timer functions (if needed), and other actions performed by the nodes
- Give brief justification for each component of your design

1. Write the pseudocode for a TCP client and server application where client sends a single "whoami" message to the server and the server responds with the message containing the "*IP address*" of the client. Your pseudocode should contain (a) the calls needed for establishing a connected socket, and (a) the logic for extracting the client IP address on the server side. You don't need to give the exact syntax of the library calls; however you should be aware of the arguments of the calls being used. [5]

2. Discuss the pros and cons of layered architecture. Be brief and precise. List the services offered by layers of Internet protocol stack. In particular, discuss the design choices made for the services that are offered in the Transport layer. [1+2+2]

3. In the context of the DNS protocol,
   a. Draw the DNS hierarchy, and list the DNS *messages* sent and received and *records* processed in obtaining the IP address corresponding to `server1.google.com`. Assume that the local resolving name-server is `ns1.daiict.ac.in` and all DNS servers performed iterated queries.
   b. Heavily loaded application servers are frequently replicated across multiple networks and machines. In these cases, all these replicated servers have different IP addresses but are mapped to same domain name entry. For example, www.google.com is mapped to a number of physically separated machines across networks. How can DNS be used to *balance load* and improve fault-tolerance on such replicated servers? [3+2]

4. An ack-based link protocol (waiting for ack before sending next packet) uses a timer to abort ack_wait function after the timeout period T and retransmits the same packet. This process continues till the packet is successfully transmitted before moving to a new packet.
   a. How would you define the efficiency of such a protocol.
   b. 10 packets are sent on a channel. Each packet takes 10ms to transmit. Acks take exactly 100ms to arrive after the transmission. Two of the ten packets got corrupted the first time they were sent (these needed to be retransmitted once). No other packets suffered corruption. Compute the efficiency of the protocol in each case when timeout value T is set to (i) 150ms, (ii) 120ms, and (iii) 80ms. [2+3]

Dhirubhai Ambani Institute of Information & Communication Technology
Final Examination, Semester I 2018-19

Course Title	IT304 Computer Networks		**Max Marks**	35%
Date	28 November 2018	**CLOSED BOOK**	**Time**	2 Hours

Questions are worth 5 marks each.

1. What is the purpose of the flow ID field in IPv6 header? Explain how tunneling is used to allow incremental deployment of IPv6 and co-existence of IPv4 and IPv6?

2. A token bucket controller for bursty traffic can be designed by using different [A,B] values where A is the token generation rate and B is the token bucket size. An bursty source has a peak rate of 200 KB/sec, long term average of 100 KB per second and burst size of 500 KB.

   Compute the maximum delay suffered by packets for the values of A=100 KB/sec, A=150 KB/sec and A=200 KB/sec. What are the respective values of B so that there are no packet losses?

3. Briefly describe the operation of slotted ALOHA. For a system with N active nodes, find the relation between p and N that maximizes the system throughput.

4. In the context of IEEE 802.3 (Ethernet) LAN protocol, answer the following:
   a. Briefly describe the functioning of CSMA/CD protocol.
   b. In terms of the relevant LAN parameters (length L, packet size B, link capacity C etc.) derive an expression for the maximum time T_{cl} during which collision may take place.
   c. Explain the need of exponential back-off mechanism in 1-presistent CSMA/CD.

5. Clearly describe a reverse-path-forwarding based multicast protocol that is suitable for dense multicasting. Your answer should contain the following details:
   a. Multicast group creation
   b. Reverse Path Forwarding
   c. Multicast Tree management

6. Briefly describe the Token-ring protocol. Derive the expression for efficiency of the protocol as a function of active nodes N in terms of relevant MAC parameters (Lengh L, pkt size B, propagation speed V, capacity C, Token size b etc.)

7. Describe the functioning of a switched hub in a LAN and its impact on the system goodput. Explain the additional capabilities present in a port-based L3 switch and how it functions.