



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

Time: 1 hour

Max Points: 60

Your ID: \_\_\_\_\_

Name: \_\_\_\_\_

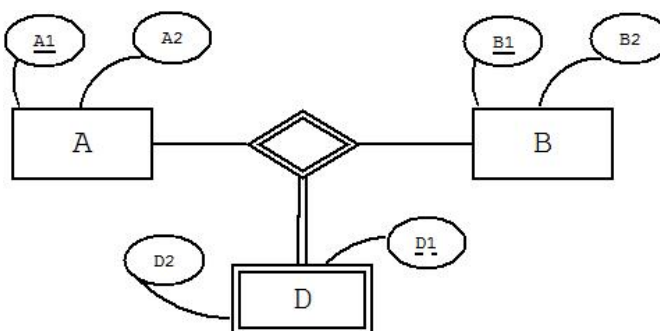
1a	1b	2a	2b	2c	2d	2e	3a	3b	3c
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**IMPORTANT NOTE:**

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)
5. You may have to pay penalty for lengthier solutions.

1. Consider ER Diagram given here, and do following [15]

- (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.



$A1 \rightarrow A2$   
 $B1 \rightarrow B2$   
 $A1B1D1 \rightarrow D2$

$A(A1A2)$   
 $B(B1B2)$   
 $D(A1B1D1D2)$

2. In next question you are given a number of relations and FDs over them. You need to do following for each relation -
- Compute key(s)
  - Determine highest normal form of the relation (consider only up-to 4NF)
  - 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.
  - 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) AB → CDE C → ADE	Key: AB	Normal Form: 2NF	Culprit FD: C → DE
	Normalized Relations  R1(ABC); 3NF [can't decompose because FDs will be lost] R2(CDE); 4NF		
R(ABCDE) AB → CD A → BE	Key: A	Normal Form: 4NF	Culprit FD: None
	Normalized Relations		
R(ABCDE) A → BCDE BC → DE	Key: A	Normal Form: 2NF	Culprit FD: BC → DE
	Normalized Relations  R1( <u>BC</u> DE) R2(A <u>BC</u> )		
R(ABC) A → BC B → AC AB → C	Key: AB	Normal Form: 4NF	Culprit FD: None
	Normalized Relations		
R(ABCD) A → BC A → D	Key: ABCD	Normal Form: BCNF	Culprit FD: Both MVDs
	Normalized Relations  R1(ABC) R2(AD)		

3. Consider following Relation R and given FD set

[5+10+10]

R(ABCDEFGHJIJ)

$A \rightarrow BDEF$

$G \rightarrow ABDEFHIJ$

$D \rightarrow E$

$I \rightarrow J$

- a. Compute Minimum FD set and write in compact and canonical form.

$A \rightarrow BDF$  (FD1)

$G \rightarrow AHI$  (FD2)

$D \rightarrow E$  (FD3)

$I \rightarrow J$  (FD4)

- b. Compute Key and Normal Form

GC [ $GC^+ = ACGHIBDFEJ$ ]

- c. Decompose the R using BCNF Decomposition Algorithm [Try choosing steps where FDs are not lost]

R(ABCDEFGHJIJ)

Decompose R based on FD  $I \rightarrow J$

R1(IJ)

$I \rightarrow J$  (BCNF)

R2(ABCDEFGHI)

$A \rightarrow BDF$  (FD1)

$G \rightarrow AHI$  (FD2)

$D \rightarrow E$  (FD3)

Key: AC (not in BCNF)

Decompose R2 based on FD  $D \rightarrow E$

R21(DE)

$D \rightarrow E$  (BCNF)

R22(ABCDGHI)

$A \rightarrow BDF$  (FD1)

$G \rightarrow AHI$  (FD2)

Key: AC (not in BCNF)

Decompose R22 based on FD2

R221(GAHI)

$G \rightarrow AHI$  (BCNF)

R222(ABCDF)

$A \rightarrow BDF$  (FD1)

Key: AC (not in BCNF)

R2221(ABDF)

$A \rightarrow BDF$  (BCNF)

R2222(AC)

BCNF