THE COPPERBELT UNIVERSITY

SCHOOL OF INFORMATION AND COMMUNICATION TECHNOLOGY

DECEMBER, 2022 – SESSIONAL EXAMINATIONS

CS520 – ADVANCED DATABASE TECHNOLOGY

TIME ALLOWED: THREE HOURS

INSTRUCTIONS :

- **Maximum Marks Available – 100**
- **This Paper has SIX(6) Questions**
- **Answer Any FIVE(5) Questions**
- **All Questions Carry Equal Marks (20 marks)**

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QUESTION ONE

a) What are file based systems and give four (4) examples of the file types that may be used in these systems. **[4 marks]**

b) State and describe six (6) problems associated with file based processing. **[6 marks]**

c) A relation is a table with columns and rows. Only applies to logical structure of the database, not the physical structure. What is your understanding of this statement **[4 marks]**

d) Briefly discuss s to how tables in a relational database can be related. **[6 marks]**

QUESTION TWO

a) State the algorithm for computing the minimal cover of a set of functional dependencies and hence or otherwise find the minimal cover for $R = (A, B, C)$ **and set of FDs F:** $\{A \rightarrow C, AC \rightarrow B, B \rightarrow A, C \rightarrow AB\}$ **[8 marks]**

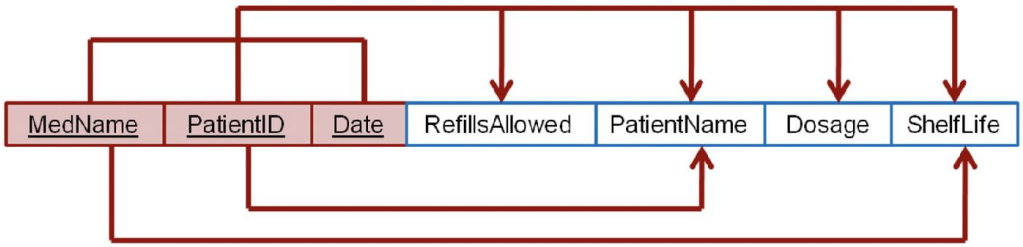
b) The 4 Functional Dependencies below are identified between various attributes of parts in a company warehouse:

FD1: Part No -------> Part Description, FD2: Pack Size, Part No --------> Price

FD3: Pack Size, Part No ---> Floor No, FD4: Floor No -------> Storage Location

Produce the Relational Schema in the Second Normal Form and then in the third Normal Form. **[6 marks]**

c) Normalise the schema below to 1st, 2nd and 3rd Normal forms. **[6 marks]**



QUESTION THREE

a) Consider the relation R = {A, B, C, D, E, F, G, H, I,J} and the set of functional dependencies. F ={{A, B} → {C}, {A} → {D, E}, {B} → {F}, {F} →{G, H},{D}→ {I, J }}, Determine the key for R and hence or otherwise decompose R into 2NF and then 3NF relations. **[8 marks]**

b) State and describe the three (3) important properties of decomposition as discussed in class. **[6 marks]**

c) Consider the set of attributes {Drinker, Address, Pub, Location, Beer, Cost }, along with the following set of FDs: Drinker -> Address Pub -> Location Pub, Beer -> Cost, Location .

Use the decomposition method to produce a set of 3NF relation schemas for the above. **[6 marks]**

QUESTION FOUR

a) State the forth normal form and hence or otherwise normalize the following to fourth normal form. R = (A, B, C, G, H, I) and a set of multivalued dependencies F ={ A →→ B, B →→ HI, CG →→ H } **[8 marks]**

b) Find the minimal cover of the set of functional dependencies given;

F={A → C, AB → C, C → DI, CD → I, EC → AB, EI → C} **[6 marks]**

c) Write a PL/SQL procedure that displays the string 'Hello World!' on the screen when executed. **[6 marks]**

QUESTION FIVE

a) Write the PL/SQL IF Statement that sets the sales commission to 20% if the sales revenue is greater or equal to K1,000,000, 15% if the sales revenue is between K500,000 and K1,000,00, 10% if the sales revenue is between K300,000 and K500,000. Otherwise, the sales commission is set to 5%. **[6 marks]**

b) Use the PL/SQL Case statement to calculate the sales commission in Question Five a) above. **[8 marks]**

c) Define a closure of a set of functional dependencies and hence or otherwise state the Armstrong's F axioms. **[6 marks]**.

QUESTION SIX

a) Write the general syntax for creating a PL/SQL function and briefly explain the code. **[6 marks]**

b) Use the IF-THEN-ELSIF Statement in PL SQL to write a program which inputs student marks, and prints the grades as follows: below 40, D, between 40 and 50, D+, between 50 and 65, C, between 65 and 75, B and above 75, A. **[8 marks]**

c) Write a PL/SQL program that will get the Surname of an employee who manages the department located in Lusaka', assign it to a variable and display it on the screen. **[6 marks]**

……**THE END**…….