



SCHOOL OF APPLIED SCIENCE AND OPEN LEARNING
ICT DEPARTMENT
BACHELOR OF SCIENCE ICT WITH EDUCATION

ICT 235: DATABASE SYSTEMS
SESSIONAL EXAMINATION 2024
DURATION: 3 HOURS

INSTRUCTIONS:

1. Write your Student Identification Number on the Answer Booklet provided
 2. Answer any five (5) questions
-

INSTRUCTIONS:

- Answer five (5) questions only.
 - Clearly number the questions you have answered.
-

Question 1

- a) i) Define the FOUR terms that form the ACID acronym which defines the correct behaviour of transactions on a relational database. (8 marks)
- ii) Which ONE of these four terms is most likely to affect the throughput of transactions when multiple users access the database? Justify your answer. (4 marks)
- b) The terms Authorisation and Authentication are associated with techniques that maintain database security and integrity. Explain the difference between these terms and outline the basic techniques that they use. (8 marks)

Question 2

- a) One possible disadvantage of a database approach compared to a more traditional file based approach relates to performance. Explain why this might be so and what might be done to combat this. (5 marks)
- b) List the three generations of DBMSs. (3 marks)
- c) Database design is made up of three main phases: conceptual, logical, and physical design. Explain briefly what is involved in these phases. (12 marks)

Question 3

- a) Discuss the potential security threats that can occur in a database environment. (12 marks)
- b) What controls can be used to counter the threats discussed in Question 3(a)? (8 marks)

Question 4

A travel agent has a booking service in which customers can book available seats on flights a day or so before the departure date. Sales are brisk as there are many bargain hunting customers trying to get seats at discounted prices.

Consider the following transcript of a telephone conversation between a ticket agent and a customer:

Customer: "I'd like two tickets to Honolulu for January 15."
Ticket agent: "OK, I have two seats on flight number 192 leaving at 10 a.m."

Customer: "What is the price?"
Ticket agent: "£900"

Customer: "Great, I'll take them."
Ticket agent: "The screen has refreshed and the price now is £920"

Customer: "OK please book them."
Ticket agent: "Oops – I'm sorry. I just tried to reserve them, and they've been sold by another agent.
Nothing else seems to be available on that date."

Customer: "Argh – that's frustrating *!.... "

Study the above transcript and then answer the following:

- i) Explain the need for concurrency control given the problems that have occurred above. (4 marks)

- ii) Describe each of the following anomalies that can occur in database processing and discuss how they could be the cause of the problems that occurred above:
 - Lost Update
 - Dirty Read
 - Unrepeatable Read.

(12 marks)

b) Describe Transaction Recovery and explain its importance in the processing of database transactions. (4 marks)

Question 5

- a) Describe the five components of the DBMS environment (15 marks)
- b) List some of the disadvantages of DBMSs. (5 marks)

Question 6

Use the following tables to answer the questions below:

Employee Table

Emp_No	Emp_Name	Start_Date	Dept
1234	John Smith	01-Jul-1983	10
2345	Julie Brown	15-May-2001	10
3456	Tom Jones	01-Mar-2010	20
2245	Susan Sharp	01-Feb-2015	30
1498	Peter Thomas	15-Sept-1999	20
3214	Vera Jones	25-Jun-1995	30
4512	Ali Patel	15-Oct-2005	10

Department Table

Dept No	Dept Name
10	Sales
20	Research
30	Human Resources
40	Manufacturing

- a. Write a SQL statement to produce a list of all the records in the Employee table. (3 marks)
- b. Write a SQL statement to produce the Emp_No, Emp_Name, Start_Date of all employees who work in department 20 (4 marks)
- c. Write a SQL statement to produce a list of employee names (Emp_Name) who started on, or after the 1st January 2000. (4 marks)
- d. Write a SQL statement that produces a list of department names that have no employees. (5 marks)
- e. It has been decided that the budget for the department needs to be stored, for example:

Dept_No	Dept_Name	Budget
10	Sales	10,000
20	Research	500,000
30	Human Resources	15,000
40	Manufacturing	25,000

Write a SQL statement to make this change to the table structure.

(4 marks)



KAPASA MAKASA UNIVERSITY
Department of Education and Open Learning
BSc. in Information and Communication Technology
Course: Engineering Mathematics
Course Code: MA210
SESSIONAL EXAMINATIONS
Venue: Upper Library
Date: October 14, 2024; Duration: 3 Hours

Instructions:

- This **Sessional Examination** consists of **7 questions** over 4 pages.
- Answer **any 5** questions.
- Show all the necessary working to earn full marks
- Non programmable scientific calculator can be used

Question 1: (20 marks)

- (a) Show that the characteristic equation of the matrix

$$A = \begin{pmatrix} 2 & 1 & 0 \\ 0 & 3 & 1 \\ 0 & 0 & 4 \end{pmatrix}$$

is satisfied by its own matrix A .

- (b) Solve the following system of simultaneous differential equations using Laplace Transforms:

$$2\frac{dy}{dt} - y + x + \frac{dx}{dt} = 5\sin t, \quad 3\frac{dy}{dt} + x - y + 2\frac{dx}{dt} = e^t$$

where $x(0) = 0$, $y(0) = 0$ and $t = 0$

Question 2: (20 marks)

- (a) Let

$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$

Find the similarity transformation that diagonalises matrix A

- (b) Define the Laplace Transform and explain its importance in solving differential equations. Why is the inverse Laplace Transform necessary?
(c) State and prove the first shifting theorem of Laplace Transforms.

Question 3: (20 marks)

- (a) Determine the Fourier series for the function $f(\theta) = \theta^2$ in the range $-\pi < \theta < \pi$. The function has a period of 2π . Let $\theta = \pi$ and show that

$$\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$$

- (b) Find the directional derivative of the scalar point function $f = x^2y + y^2z + z^2x$ at the point $(3, 3, 3)$ in the direction of the normal to the surface $4x^2y + 2z^2 = 2$ and at the point $(2, -1, 3)$

Question 4: (20 marks)

- (a) Show that the following 3 by 3 square matrix normalizes to 1:

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$$

- (b) Solve the differential equation using the Laplace transform:

$$\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + 2y = \sin(t), \quad y(0) = 0, \quad y'(0) = 0$$

- (c) A vector \bar{r} is defined by $\bar{r} = ix + jy + kz$. If $|\bar{r}| = r$ then show that the vector $r^n \bar{r}$ is irrational.

Question 5: (20 marks)

- (a) Determine

$$\int \frac{dx}{\cos x}$$

using trigonometric substitution. (Hint: $t = \tan \frac{x}{2}$)

- (b) Test the following for convergence and state the the Radius and interval of convergence and draw the number line.

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}(x-4)^n}{n9^n}$$

- (c) Find the characteristic equation of the matrix $A = \begin{pmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{pmatrix}$,

verify Cayley -Hamilton theorem and hence evaluate the matrix equation

$$A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 = 5A^3 - 8A^2 + 2A - I$$

Question 6: (20 marks)

(a) Show that

$$\int_1^2 \left(\frac{2 + \theta + 6\theta^2 - 2\theta^3}{\theta^2(\theta^2 + 1)} \right) d\theta = 1.606,$$

correct to 3 significant figures

(b) Solve the Bernoulli equation $2y - 3\frac{dy}{dx} = y^4 e^{3x}$

Question 7: (20 marks)

(a) Find the power series representation for the function

$$f(x) = \frac{1}{(x-1)(x+2)}.$$

For each resulting fraction from the decomposition, express it as a geometric series. Then, combine these geometric series to obtain a single power series for $f(x)$ and determine the radius and interval of convergence.

(b) Evaluate

$$\int_0^{\frac{\pi}{3}} \sqrt{1 - \frac{1}{3}\sin^2\theta} d\theta$$

using Simpson rule with 6 intervals, correct to 3 decimal places.



SCHOOL OF APPLIED SCIENCE AND OPEN LEARNING
DEPARTMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY
BACHELOR OF CYBER SECURITY

SOFTWARE ENGINEERING
ICT230

SESSIONAL EXAMINATION

DATE: 04-Nov-2024

TIME: 14.00 - 17.00 HRS, 3 HOURS

Instructions to candidates

1. Write your **Name** and **Student ID** on the **Answer Sheet** provided
2. There are **Seven (7) questions** in this paper. Attempt only **five (5)**. **Questions 1 and 2 are compulsory**. Indicate on the Answer sheet your choice from the optional questions.
3. Write your Answers on the answer Sheet provided.
4. No Foreign material will be allowed in this examination.
5. The number of marks is shown in brackets [] at the end of each question or part question.
6. Clear handwriting and neat work is encouraged.
7. The total number of marks for this paper is **100**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

[Question 1]

- A. Define the systems development life cycle [SDLC] and explain its main phases. How does the SDLC help in managing the development of information systems? **[6 Marks]**
- B. Describe the key responsibilities of a systems analyst in each phase of the SDLC. **[6 Marks]**
- C. Explain the concept of feasibility study in project initiation. What are the three main types of feasibility that should be considered? **[8 Marks]**

[Question 2]

- A. Define the following object-oriented concepts and explain their importance in software design:

- i. Classes and Objects
- ii. Attributes and Methods
- iii. Inheritance and Polymorphism **[9 Marks]**

- B. Draw a class diagram for a simple Bank Account system with the following classes:

- BankAccount [attributes: accountNumber, balance; methods: deposit, withdraw, getBalance]
- SavingsAccount [inherits from BankAccount, additional attribute: interestRate; additional method: calculateInterest]
- CheckingAccount [inherits from BankAccount, additional attribute: overdraftLimit; modified method: withdraw]

Clearly show the relationships between the classes. **[6 Marks]**

- C. Write a C++ code snippet to define the BankAccount class with its attributes and methods. Demonstrate the use of encapsulation by making the attributes private and providing public getter and setter methods. **[5 Marks]**

[Question 3]

- A. Compare and contrast the traditional Waterfall model and Agile methodologies in software development. What are the key differences in their approach and suitability for different types of projects? **[8 Marks]**

- B. Explain the concept of requirements gathering in software engineering. Describe two modern techniques used for eliciting and documenting system requirements. [6 Marks]
- C. What is the role of CASE [Computer-Aided Software Engineering] tools in systems development? Provide two examples of CASE tools and explain their benefits. [6 Marks]

[Question 4]

- A. Describe the Model-View-Controller [MVC] architectural pattern. How does it promote separation of concerns and modularity in software design? [5 Marks]
- B. Draw a sequence diagram to illustrate the interaction between objects in a typical online shopping scenario [User, ShoppingCart, Product, Payment]. Explain your design choices. [10 Marks]
- C. What is the difference between collaboration diagrams and sequence diagrams in UML? When would you prefer to use one over the other? [5 Marks]

[Question 5]

- A. Explain the concept of coupling and cohesion in software design. Why is it desirable to have low coupling and high cohesion in a system? [6 Marks]
- B. Describe three key principles of effective input design in software engineering. Provide examples of how these principles can be applied in a real-world application. [9 Marks]
- C. What are the main objectives of output design? Explain two factors that should be considered when designing user interfaces for effective information presentation. [5 Marks]

[Question 6]

- A. Describe the four main levels of software testing and their purposes:
- i. Unit Testing
 - ii. Integration Testing
 - iii. System Testing
 - iv. Acceptance Testing [8 Marks]
- B. What is the role of a test plan in software testing? Outline the key components that should be included in a comprehensive test plan document. [6 Marks]
- C. Explain the concept of risk management in software projects. Describe two common risks and suggest appropriate mitigation strategies for each. [6 Marks]

[Question 7]

- A.** Compare and contrast two popular software development methodologies: Structured Systems Analysis and Design Method [SSADM] and Rapid Application Development [RAD] **[8 Marks]**
- B.** What is the purpose of a post-implementation review in software development? Describe three key areas that should be assessed during this review. **[6 Marks]**
- C.** Explain the importance of software documentation. Describe two types of documentation that are essential for the long-term maintainability of a software system. **[6 Marks]**

The End
All the best!



KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCE AND OPEN LEARNING
DEPARTMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY
BACHELOR OF SCIENCE IN ICT WITH EDUCATION
ICT 220 – COMPUTER ARCHITECTURE AND ORGANIZATION
SESSIONAL EXAMINATIONS

Date: 17th October, 2024.

Time: 3 hours

Total Marks: 100.

Instructions to candidates:

Write your Student Identification number on the answer booklet provided.

This paper consists of three (3) sections:

- *SECTION A: Answer all questions from this section. 20 Marks*
- *SECTION B: Answer all questions from this section. 40 Marks*
- *SECTION C: Answer question one and choose any 40 Marks*

Calculators are allowed.

SECTION A [20 MARKS]

Answer all the questions in this section.

1.

a) Discuss the Memory Hierarchy in computer system with regard to speed, size and cost? **[6marks]**

b) Explain the computer's main/primary memory and its types. **[4marks]**

2.

a) The denary values 64, 101 and 242 are converted to 8-bit binary values. Give the 8-bit binary value for each denary value. *(show your working)*

i. 64 **[2 marks]**

ii. 101..... **[2 marks]**

iii. 242..... **[2 marks]**

b) The hexadecimal values 42 and CE are converted to binary. Give the binary value for each hexadecimal value. *(show your working)*

i. 42 **[2 marks]**

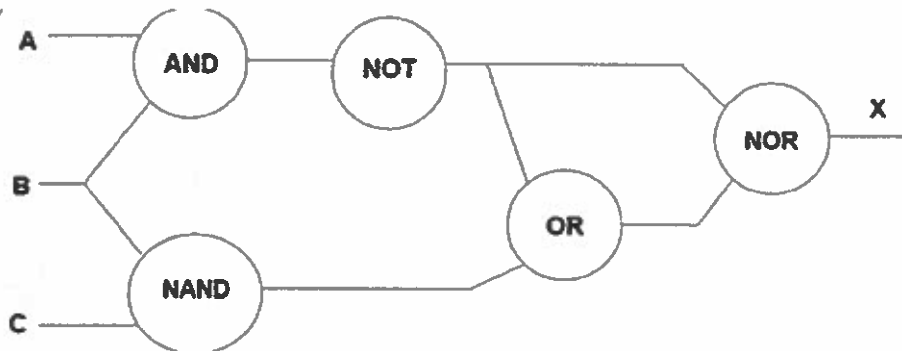
ii. CE **[2 marks]**

SECTION B [40 MARKS]

Answer all the questions in this section.

1. (a) Draw an **AND gate** and a **NOT gate** and show the truth table for the two gates (AND and NOT) **[8 marks]**

(b) Complete the truth table for the below shown logic gate **[12 marks]**



A	B	C	X
1	1	1	
1	1	0	
1	0	1	
1	0	0	
0	1	1	
0	1	0	
0	0	1	
0	0	0	

2. (a) Use examples to help you explain the difference between Computer Organization and Computer Architecture. **[8 marks]**
- (b) Define the following terms;
- i. RAM **[2 marks]**
 - ii. ROM **[2 marks]**
 - iii. Peripheral device..... **[2 marks]**
 - iv. SSD..... **[2 marks]**
 - v. Cache Memory **[2 marks]**
 - vi. USB **[2 marks]**

SECTION C [40 MARKS]

Question 1 is compulsory and choose any one question from the remaining 2.

1. Compare and contrast the first, second and third generation of computers in terms of their technology, size and performance? **[20 marks]**
2. Discuss the various types of computer malware and their impact on computer security. Also describe mechanism that you can use to protect the computer system against your named malware. **[20 marks]**
3. Draw and explain the block diagram of a computer system, identifying the key components and their interactions. **[20 marks]**

KAPASA MAKASA UNIVERSITY



2024 SESSIONAL EXAMINATION PRINCIPLES OF EDUCATION – PE210

INSTRUCTIONS:

1. Time Allowed **THREE (3)** Hours
2. Attempt Any **FIVE (5)** Questions
3. Each Question Carries **TWENTY (20)** Marks
4. Ensure You Indicate Your **SIN** On Your Answer Script

QUESTION ONE

Prepare a grade nine ICT End of Term Test which is guided by Bloom's Taxonomy active cognitive verbs. (20 marks)

QUESTION TWO

Write brief notes on the following:

- a) Drivers constructivism's learning theory
 - b) social learning theory
 - c) Classical conditioning
 - d) Edgar Dales's Cone experience
 - e) Edward Nkonde's 2018 on the use of mother tongue on a medium of instruction
- (4 marks each)

QUESTION THREE

Define the following:

- a) Socialisation
- b) Quality of education
- c) Sustainable development
- d) Pedagogy
- e) Education psychology

(4 marks each)

QUESTION FOUR

Write a 500 word essay on 5 different types of transfer of learning. (20 marks)

QUESTION FIVE

Discuss with clear pedagogical examples of two of the following:

- a) Edward Thorndike trial and error experiment
- b) Levy Vygotsky's theory of learning
- c) Abrahams Maslow's motivation hierarchy (20 marks)

QUESTION SIX

State 4 advantages and 3 disadvantages of Jerome Bruner's discovery learning theory. (20 marks)

QUESTION SEVEN

- a) List 5 major challenges of education the Zambian government has been trying to address since 1964. (15 marks)
- b) What have been the main obstacles for each challenge above? (5 marks)

QUESTION EIGHT

- a) State various reasons why the teaching profession has lost its past glory?
- b) Why has the government introduced free education in Zambia?
- c) What are the social and economical functions of education in African countries?

(20 marks)

END OF EXAMINATION