

C 23422

Name.....

Reg. No.....

THIRD SEMESTER M.C.A. (LATERAL ENTRY) DEGREE [SUPPLEMENTARY]
EXAMINATION, APRIL 2022

M.C.A.

MCA L18 304D—MOBILE COMPUTING

(2018 Syllabus)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

Each full question carries 20 marks.

1. a) Write notes on characteristics of mobile computing.
b) Draw and explain cellular architecture in detail.
2. a) What are the advantages of wireless communication ? Explain different types of multiplexing.
b) What is a channel ? What are different types of channel allocation ?
3. a) Discuss about location management update principles.
b) Explain two tier and tree architecture used for location management.
4. a) Explain individual mobility model in detail.
b) Differentiate IPv4 and IPv6 protocol.
5. a) What is WSN ? What are various applications of WSN ?
b) What are sensor networks ? Write about the protocols used in sensor network routing.
6. a) Write down any two location management algorithms.
b) Why location management is important ?
7. a) Compare and contrast traditional TCP and m-TCP.
b) Discuss different ways by which information dissemination is carried out.

C 23418

Name.....

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**THIRD SEMESTER M.C.A. (LATERAL ENTRY) DEGREE
(SUPPLEMENTARY) EXAMINATION, APRIL 2022**

M.C.A. (Lateral Entry)

MCA L18 303—PRINCIPLES OF COMPILERS

(2018 Syllabus)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

Each question carries 20 marks.

1. A) Explain with examples DFAs for lexical analyzers. (10 marks)
B) Describe the role of lexical analyzer in input buffering. (10 marks)
2. A) Explain ambiguity and associativity in parse tree for syntax analysis. (10 marks)
B) Describe parsing prediction and pruning with examples. (10 marks)
3. A) Describe triples in compiler intermediate code generation. (10 marks)
B) Illustrate the steps for constructing the DAG. (10 marks)
4. A) With examples explain the major issues with nested procedures. (10 marks)
B) Explain memory hierarchy and its management in run time environments. (10 marks)
5. A) Explain static allocation in run time address for names with examples. (10 marks)
B) Explain an activation tree call during the execution of quicksort. (10 marks)
6. A) Explain with example regular expressions for finite automata. (10 marks)
B) Describe shift reduce parsing with an example. (10 marks)
7. A) Explain type declarations in compilers. (10 marks)
B) Explain calling sequences and its access to data stack. (10 marks)

THIRD SEMESTER M.C.A. DEGREE (LATERAL ENTRY) EXAMINATION
APRIL 2022

MCA Lateral Entry

MCA L 18 302—WIRELESS COMMUNICATION

(2018 Syllabus)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

Each question carries 20 marks.

1. (A) Describe the principle of CDMA. Differentiate between FDMA, TDMA and CDMA technologies. (10 marks)
(B) Explain the telephone system and its role in data communications. (10 marks)
2. (A) Explain the concept of GSM superframe, multiframe, TDMA frame and time slot in GSM channel. (10 marks)
(B) Define 3G and 4G. Give suitable illustration for GSM frame hierarchy. (10 marks)
3. (A) What are advantages and disadvantages of mobile TCP ? How is mobile TCP different from traditional TCP ? (10 marks)
(B) What are the different types of digital modulation techniques employed for mobile communication ? Explain the most preferred modulation technique. (10 marks)
4. (A) Explain the main benefits of IEEE 802.11b WLAN standards. (10 marks)
(B) What are the advantages and disadvantages of IEEE 802.11a WLANs ? (10 marks)
5. (A) Draw and explain the architecture of WAP. (10 marks)
(B) What is WAP protocol ? Write the purpose of WAP specification ? (10 marks)

6. (A) What is meant by spectral efficiency of FDMA ? Explain important parameters of wireless communication network.
(10 marks)
- (B) Explain briefly the characteristics of cell-site antennas and mobile antennas.
(10 marks)
7. (A) What is wireless broadband WiMAX technology ? How is it different from wireless LAN technology ?
(10 marks)
- (B) Draw the GSM network architecture. Identify various interfaces used in its different entities.
(10 marks)

**THIRD SEMESTER M.C.A. (LATERAL ENTRY) [SUPPLEMENTARY]
DEGREE EXAMINATION, APRIL 2022**

M.C.A. Lateral Entry

MCA L 18 301—COMPUTER GRAPHICS

(2018 Syllabus)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

Each question carries 20 marks.

1. A) Differentiate between vector scan and raster scan display. (10 marks)
B) What are the different applications of Computer Graphics ? Explain. (10 marks)
2. A) With suitable example, explain Bresenham's line drawing algorithm. (10 marks)
B) Use midpoint circle drawing algorithm to plot a circle whose radius is 20 units and center is (50, 30). (10 marks)
3. A) Explain Sutherland Hodgeman polygon clipping algorithm with illustration. (10 marks)
B) Give the matrix representation of two-dimensional transformations. (10 marks)
4. A) Differentiate parallel and perspective projections and derive their projection matrices.
B) Derive the composite transformation matrix to align an arbitrary vector in 3-D space with the Z-axis. (10 + 10 = 20 marks)
5. A) Give an account on Key-frame systems. (10 marks)
B) What is Kinematics movement ? Why do we use Kinematics ? Explain the three different concepts of Kinematics. (10 marks)
6. A) Explain the operations of a video controller with suitable diagram. (10 marks)
B) Explain four connected boundary filling algorithms with an example. (10 marks)
7. A) Differentiate between Bezier curves and B-Spline curves. (10 marks)
B) Describe Z-buffer method. What are the different situations where this method gives more efficient results ? (10 marks)

D 34389

Name.....

Reg. No.....

**THIRD SEMESTER M.C.A. (SPECIAL) SUPPLEMENTARY DEGREE
EXAMINATION, SEPTEMBER 2017**

MCA 2K 305—SOFTWARE ENGINEERING

(2000 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

*Answer any five full questions.
Each question carries 20 marks.*

1. (a) What is a software process model ? What are the costs of Software Engineering ?
(5 + 5 = 10 marks)
- (b) Explain system requirements definition and system design in the system engineering process.
(10 marks)
2. (a) Give the structure of a requirements document and explain its parts. (10 marks)
- (b) Summarize the requirements elicitation and analysis phase of the requirements Engineering Process.
(10 marks)
3. (a) Distinguish between Evolutionary and Throw away prototyping. (10 marks)
- (b) Explain any two rapid development techniques that are practical for developing industrial-strength prototypes.
(10 marks)
4. (a) Write on the deployment of Algebraic specification for Interface specification.
(10 marks)
- (b) Briefly outline the control models.
(10 marks)
5. (a) What do you mean by Component-Based Development ? How does it support reuse ?
(10 marks)
- (b) Discuss the MVC Model of user interaction.
(10 marks)
6. (a) Explain the term 'critical systems'. Give an example of a safety critical system.
(10 marks)
- (b) Describe Cleanroom Software Development.
(10 marks)
7. (a) Explain COCOMO Model.
(10 marks)
- (b) Write on the Process Capability Maturity Model.
(10 marks)

[5 × 20 = 100 marks]

**THIRD SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 18 305—NUMERICAL ANALYSIS AND OPTIMIZATION TECHNIQUES
(2018 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

Each question carries 20 marks.

1. A) Given that $u = \frac{5xy^2}{z^3}$, find the relative error at $x = y = z = 1$ when the errors in each of x, y, z is 0.01. (5 marks)
 B) Find the real root of the equation $f(x) = x^3 + x^2 + x + 7 = 0$ correct to three decimal places using bisection method. (10 marks)
 C) Given that the equation $x^{2.2} = 69$ has a root between 5 and 8. Use the method of regular-falsi to determine it. (5 marks)

2. A) Use the iterative method to find a positive root of the equation $xe^x = 1$, given that a root lies between 0 and 1. Give your answer correct to four decimal places. (10 marks)
 B) Using Newton-Raphson method, find a real root, correct to 3 decimal places, of the equation $\sin x = x/2$ given that the root lies between $\pi/2$ and π . (10 marks)

3. A) Using the method of separation of symbols, show that :

$$e^x \left(u_0 + x\Delta u_0 + \frac{x^2}{2!} \Delta^2 u_0 + \dots \right) = u_0 + u_1 x + u_2 \frac{x^2}{2!} + \dots$$

(10 marks)

B) Using Newton's forward difference formula, find the sum $s_n = 1^3 + 2^3 + 3^3 + \dots + n^3$.

(10 marks)

4. A) Using the Lagrange interpolation formulae, find the form of the function $y(x)$ from the following table :

x	y
0	-12
1	0
3	12
4	24

(10 marks)

B) Show that : $[x_0, x_1] = \int_0^1 y' (x_0 t_0 + x_1 t_1) dt_1$ where $t_0 \geq 0$ and $t_0 + t_1 = 1$.

(10 marks)

5. A) Solve the equations using Gauss-Jordan method :

$$2x + y + z = 10$$

$$3x + 2y + 3z = 18$$

$$x + 4y + 9z = 16.$$

(10 marks)

B) Solve the equations using LU decomposition.

$$2x + 3y + z = 9$$

$$x + 2y + 3z = 6$$

$$3x + y + 2z = 8$$

(10 marks)

6. A) Evaluate the following using Simpson's $\frac{1}{3}$ rule with $h = 0.25$.

$$\int_0^2 \frac{dx}{x^3 + x + 1}.$$

(10 marks)

- B) Use the trapezoidal rule to evaluate, $\iint_{-2}^2 (x^2 - xy + y^2) dx dy$. (10 marks)

7. A) Given the differential equation $\frac{dy}{dx} = \frac{x^2}{y^2 + 1}$, with the initial conditions $y = 0$ when $x = 0$, use Picard's method to obtain y for $x = 0.25, 0.5$ and 1.0 correct to three decimal places.

(10 marks)

- B) Solve the initial value problem defined by $\frac{dy}{dx} = \frac{3x + y}{x + 2y}$, and $y(1) = 1$ and find $y(1.2)$ and $y(1.4)$ by the Runge-Kutta fourth order formula.

(10 marks)

**THIRD SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 18 304—SOFTWARE ENGINEERING

(2018 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

Each question carries 20 marks.

1. A) Explain the different phases of the life cycle model of software development. Write the merits and demerits. (10 marks)
B) What is Scrum process ? Explain in detail. (10 marks)
2. A) What are the characteristics of good SRS ? Describe the differences between system requirement and software requirement specification. (10 marks)
B) Explain in detail about any four architectural styles. (10 marks)
3. A) List and explain the concepts used in Object oriented environment with suitable examples and diagrams. (12 marks)
B) Discuss the concept of user interface design and list the characteristics of a goof user interface design. (8 marks)
4. A) What are the various testing strategies to software testing ? Discuss them briefly. (12 marks)
B) Describe the verification and validation criteria for a software. (8 marks)
5. A) Discuss the steps involved in project planning. (10 marks)
B) Discuss software engineering methodology used for mobile environments. (10 marks)
6. A) What is Agile software development ? How does it differ from traditional process models ?
B) What is software process ? How are process modeled ?
(10 + 10 = 20 marks)
7. A) Write a note for the following :
 - (i) Coupling and cohesion ; and
 - (ii) Feasibility study. (5 + 5 = 10 marks)
B) What is a DFD ? Draw DFDs up to 3rd level for a Grade Card Generation System. Make necessary assumptions. Mention the assumptions made. (10 marks)

[5 × 20 = 100 marks]

C 22237

Name.....

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**THIRD SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 18 303—ADVANCED JAVA PROGRAMMING

(2018 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

Each question carries 20 marks.

1. A) Explain EIS Tier and Web Tier implementation in detail. (10 marks)
B) Give an account on session management in J2EE applications. (10 marks)
2. A) What are the different types of JDBC drivers ? Explain. (10 marks)
B) Explain the processes involved in connecting a database management system as a backend of J2EE application. (10 marks)
3. A) Explain the architecture of distributed application using RMI concept. (10 marks)
B) Give an account on dynamically loaded classes in RMI. (10 marks)
4. A) Explain the different loop control statements in JSP. (10 marks)
B) What are Servlets ? Explain the life cycle of a Servlet. (10 marks)
5. A) Explain the function and syntax of any three JQuery effect methods with example. (12 marks)
B) What is AJAX ? Explain the technologies used by AJAX. (8 marks)
6. A) List out the best practices in J2EE applications. (10 marks)
B) Explain the different types of statements in JDBC with examples. (10 marks)
7. A) Explain in detail about Java Serve Page scripting components with examples. (10 marks)
B) Differentiate between marshalling and unmarshalling objects in RMI. (10 marks)

**THIRD SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 18 302—PRINCIPLES OF COMPILERS

(2018 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

*Answer any five full questions.
Each question carries 20 marks.*

1. A Briefly explain compiler construction tools. (8 marks)
- B Explain the process of constructing an NFA from regular expression $(a / b)^* abb$. Obtain DFA from NFA. (12 marks)

2. A Construct the predictive parser for the following grammar :

$S \rightarrow (L) / a..$

$L \rightarrow L, S / S.$

(10 marks)

- B Compare top down parsing and bottom up parsing methods. (10 marks)
- A Generate an intermediate code for the following code segment with the required syntax-directed translation scheme.

if ($a > b$)

$x = a + b$

else

$x = a - b$

(10 marks)

- B Explain DAG representation of basic blocks. (10 marks)
- A Explain heap management in detail. (10 marks)
- B What are the calling and return sequences ? How does it work ? (10 marks)

5. A Explain code generation phase with simple code generation algorithm. (10 marks)
B Why target machine is important in code generation? Explain in detail. (10 marks)
6. A Explain the role of Lexical Analyser in detail with necessary examples. (8 marks)
B Construct the predictive parsing table by making necessary changes to the grammar given below and show the parsing of string

*id + id * id* (LL parsing)

$E \rightarrow E + T \mid T$

$T \rightarrow T * F \mid F$

$F \rightarrow (E) \mid id$

(12 marks)

7. Explain the following :

- (i) Symbol table. (ii) Region based analysis.
(iii) Shift reduce parsing. (iv) Regular expressions.

(4 × 5 = 20 marks)

C 22235

Name.....

Reg. No.....

**THIRD SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 18 301—DATABASE MANAGEMENT SYSTEM

(2018 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

*Answer any five full questions.
Each question carries 20 marks.*

1. (a) Explain the advantages of Database Management System over traditional file system. (10 marks)
(b) Describe the naming convention and notations used for ER schema diagrams. (10 marks)
2. (a) What do you mean by database normalization ? Explain INF, 2NF, 3NF and BCNF with suitable examples. (15 marks)
(b) Give a brief account on different relational algebraic operations. (5 marks)
3. (a) What is two-phase locking protocol ? Explain how does it guarantee serializability. (10 marks)
(b) Discuss why concurrency control and recovery is needed in transaction processing in Database Management Systems. (10 marks)
4. (a) How does a shadow directory work? What issues are involved with implementing shadow paging ?
(b) List and explain the commonly accepted threats to database security. (10 + 10 = 20 marks)
5. (a) Explain the concept of Distributed Database System. Also list the advantages of Distributed Database System. (10 marks)
(b) Explain the different concepts of object-oriented database management systems. (10 marks)
6. (a) Give an account on ARIES recovery algorithm. (10 marks)
(b) What are the different data models ? Explain each one. (10 marks)
7. (a) Explain the function and syntax any two DCL and DML statements in SQL. (10 marks)
(b) Explain the ACID properties of transaction. (10 marks)

**THIRD SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 10 305—PRINCIPLES OF ACCOUNTING AND FINANCIAL MANAGEMENT
(2010 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

1. (a) Write a short note on the following : (10 marks)
 - (a) Journal,
 - (b) Posting,
 - (c) Rule of Debit and Credit,
 - (d) Banking Transaction,
 - (e) Common size Balance sheet,
 - (f) Comparative Income statement,
 - (g) Outstanding expense and
 - (h) Prepaid expenses.
2. Briefly explain the recent developments in the Indian capital market. (20 marks)
3. Explain the cause of overcapitalization and under capitalization. (20 marks)
4. What is cost control ? Explain the various steps involved in cost control. (20 marks)
5. (a) What is Balance Sheet ? Explain its characteristics and needs. (10 marks)
 - (b) Difference between Trial balance and Balance Sheet. (10 marks)
6. (a) Explain the factors determining of working capital. (10 marks)
 - (b) Prepare an estimate of working capital requirements from the following information of a trading concern :
 - i) Projected annual sales - 10,000 units
 - ii) Selling price per unit Rs. 8
 - iii) Percentage of net profit on sales 25
 - iv) Average credit period allowed to customers - 8 weeks
 - v) Average credit period allowed by suppliers - 4 weeks
 - vi) Average stock holders period of stock of finished goods - 12 weeks
 - vii) Allow 10 % for contingencies. (10 marks)
7. Explain the devices of Financial Statements Analysis. (20 marks)

**THIRD SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

MCA

MCA 10 304—CORE JAVA

(2010 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

*Answer any five full questions.**All full questions carry equal marks.*

1. a) Explain the features of Java. (15 marks)
b) Why Java is important to Internet ? (5 marks)
2. a) Define variables in Java. Explain Dynamic Initialization of variables with an example. (4 marks)
b) Write short note on the life and scope of a variable with an appropriate example. (4 marks)
c) Explain type conversion and casting in Java with suitable examples. (4 marks)
d) Write notes on : (i) Reserved keywords in Java ; (ii) Identifiers ; (iii) Literals ; and (iv) Separators. (8 marks)
3. a) Briefly explain the following :
(i) Bitwise Operators.
(ii) Write a program in Java that demonstrates Bitwise operators and conditional operator in Java. (10 marks)
b) Explain Iteration statements and Jump statements in Java with suitable examples. (10 marks)

4. a) Explain multiple inheritance in Java with appropriate example. (10 marks)
- b) Classes and packages are both means of encapsulating and containing the name and scope of variables and methods. Justify. (10 marks)
5. Describe multithreading along with the life cycle of a thread in detail. Distinguish the two different ways to create a thread with proper example. (20 marks)
6. Explain Delegation Event Model in Java. (20 marks)
7. How to establish database connection using JDBC. Explain with an example. (20 marks)

[$5 \times 20 = 100$ marks]

**THIRD SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 10 303—PRINCIPLES OF COMPILER DESIGN

(2010 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

*Answer any five question.
Each question carries 20 marks.*

- I. (a) What is Compiler ? Explain the structure of compiler in detail.
(b) Explain in detail about the role of Lexical Analyser.
- II. (a) Differentiate between Synthesized and Inherited attributes with suitable examples.
(b) Write the role of assembler, compiler, Loader and Linker in the language processing system.
- III. (a) Differentiate between top down parsing and bottom up parsing.
(b) Describe the specification of Tokens.
- IV. (a) What is syntax directed translation ? How is it different from translation schemes ? Explain with example.
(b) What is type expression ? How to construct them using various type constructors ? Explain.
- V. (a) Explain Symbol table.
(b) Explain with examples how to construct an NFA from regular expression.
- VI. (a) Explain Activation trees and control stacks.
(b) What is Intermediate code? Translate the expression $a = b^* - c + b^* - c$ into quadruples, triples and indirect triples.
- VII. (a) List out and explain the rules to construct simple precedence relation for a context free grammar.
(b) What are the sub divisions of run time memory ? Explain in detail.

(5 × 20 = 100 marks)

C 22231

Name.....

Reg. No.....

**THIRD SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 10 302—COMPUTER NETWORKS

(2010 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five questions.

Each question carries 20 marks.

1. (a) Explain Packet Switched Networks and its advantages. (10 marks)
(b) Explain about Link State Routing Algorithm. (10 marks)
2. (a) Explain Transmission Control Protocol in detail. (10 marks)
(b) Explain about subnetting and classless routing. (10 marks)
3. (a) Explain FDDI and Resilient Packet Ring. (10 marks)
(b) Explain features of ATM and layers of ATM reference model. (10 marks)
4. (a) Explain PIM. (7 marks)
(b) Explain about network topologies. (6 marks)
(c) Explain message switching. (7 marks)
5. (a) Explain about bridges, routers and gateways. (10 marks)
(b) Explain IPv6 address in detail. (10 marks)
6. (a) Explain about RIP. (8 marks)
(b) Explain Ethernet in detail. (12 marks)
7. (a) Explain about Wi-Fi. (8 marks)
(b) Explain different transmission modes. (6 marks)
(c) Explain the duties of session layer. (6 marks)

[$5 \times 20 = 100$ marks]

**THIRD SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 10 301—NUMERICAL ANALYSIS AND OPTIMIZATION TECHNIQUES
(2010 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

All full questions carry equal marks.

1. (a) Find a real root of the equation $f(x) = x^3 - 2x - 5 = 0$ using Regula Falsi Method. (10 marks)
- (b) Find a real root of the equation $x = e^{-x}$, $X_0 = 1$ the Newton-Raphson Method. (10 marks)
2. (a) Evaluate the square root of 5 using the equation $x^2 - 5 = 0$ by applying the fixed point iteration algorithm. (10 marks)
- (b) Solve the following system of equations using Triangularization Method :

$$\begin{aligned} x + 2y + 3z + 4w &= 20 \\ 3x - 2y + 8z + 4w &= 26 \\ 3x + y - 4z + 7w &= 10 \\ 4x + 2y - 8z - 4w &= 2. \end{aligned}$$
 (10 marks)
3. (a) Evaluate $\int_0^{\pi/2} \sin x dx$ using : (1) Trapezoidal ; and (2) Simpson's (1/3)rd. (10 marks)
- (b) Solve the equations using Gauss-Seidel Method :

$$\begin{aligned} 10x_1 - 2x_2 - x_3 - x_4 &= 3 \\ -2x_1 + 10x_2 - x_3 - x_4 &= 15 \\ -x_1 - x_2 + 10x_3 - 2x_4 &= 27 \\ -x_1 - x_2 + 2x_3 + 10x_4 &= -9. \end{aligned}$$
 (10 marks)

4. (a) Given the differential equation $y'' - xy' - y = 0$ with the conditions $y(0) = 1$, and $y'(0) = 0$.

Use Taylor's Series Method to determine the value of $y(0.1)$.

(10 marks)

- (b) Given the Differential equation $\frac{dy}{dx} = x^2 / (y^2 + 1)$ with the initial condition $y = 0$ when $x = 0$,

use Picard's method to obtain y for $x = 0.25, 0.5$ and 1.0 . correct three decimal places.

(10 marks)

5. (a) Consider $\frac{dy}{dx} = 1 + y^2$, where $y = 0$, when $x = 0$, find $y(0.2), y(0.6)$ using Runge-Kutta method.

(10 marks)

- (b) Determine the Value of y when $x = 0.1$ given that $y(0) = 1$ and $y' = x^2 + y$ using Modified Euler's method.

(10 marks)

6. (a) Solve by simplex method the following L.P. problem :

$$\text{Minimize } Z = x_1 - 3x_2 + 2x_3$$

$$\text{subject to } 3x_1 - x_2 + 3x_3 \leq 7$$

$$-2x_1 + 4x_2 \leq 12$$

$$-4x_1 + 3x_2 + 8x_3 \leq 10$$

$$x_1, x_2, x_3 \geq 0.$$

(10 marks)

- (b) Solve by Two-Phase Method :

$$\text{Minimize } Z = 6x_1 + 5x_2$$

$$\text{subject to } 2x_1 + x_2 \geq 80$$

$$x_1 + 2x_2 \geq 60$$

$$x_1, x_2 \geq 0.$$

(10 marks)

7. (a) Solve the following Transportation Problem :

Plant	Ware House				Availability
	W ₁	W ₂	W ₃	W ₄	
P ₁	190	300	500	100	70
P ₂	700	300	400	600	90
P ₃	400	100	600	200	180
Requirement	50	80	70	140	

(10 marks)

(b) Solve the following Minimal assignment Problem :

Job	Man			
	1	2	3	4
I	12	30	21	15
II	18	33	9	31
III	44	25	21	21
IV	14	30	28	14

(10 marks)

[5 × 20 = 100 marks]

D 13261

Name.....

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**THIRD SEMESTER M.C.A. DEGREE (REGULAR) EXAMINATION
NOVEMBER 2021**

M.C.A.

MCA 20 305 F—WIRELESS COMMUNICATION

(2020 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five questions.

Each question carries 20 marks.

1. A Explain the term interference in the space, time, frequency, and code domain. What are the counter measures in SDMA, TDMA, FDMA, and CDMA systems ? (10 marks)
- B. Summarize the features of various multiple access technique used in wireless mobile communication. (10 marks)
2. A. Write a short note on various frame formats used for GSM traffic. (10 marks)
- B. Why and when are different signalling channels needed ? Explain. What are the differences. (10 marks)
3. A. Why routing in multi-hop ad-hoc networks is complicated ? Explain. Also list the special challenges in it. (10 marks)
- B. Write a note on Revenue tunnelling. (10 marks)
4. A. Explain the problems associated with Wireless Networks. (10 marks)
- B. List the type of architecture used in IEEE 802.11. (10 marks)
5. A. Explain the functioning of Wireless Application Environment (WAE). (10 marks)
- B. Draw and explain WAP architecture with its components. (10 marks)
6. A. What is the advantage of Infra-red technology ? Differentiate between wired networks and ad-hoc wireless networks based on routing. (10 marks)
- B. Give an account on Wireless datagram protocol. (10 marks)
7. Explain the following :
 - i) Polling ;
 - ii) WDM ;
 - iii) Snooping ; and
 - iv) Tunneling.

(20 marks)

[5 × 20 = 100 marks]

**THIRD SEMESTER M.C.A. DEGREE (REGULAR) EXAMINATION
NOVEMBER 2021**

M.C.A.

MCA 20 305 E—BIOINFORMATICS

(2020 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

Each question carries 20 marks.

1. A) Discuss the double-helical structure of DNA with a diagram. (10 marks)
B) What is Microarray analysis ? What are the different tools used for the same ? (10 marks)
2. A) Discuss the exhaustive search methods and their applications in Computational Biology.
B) Discuss any one string matching algorithm in detail. (10 + 10 = 20 marks)
3. A) Explain the steps involved in BLAST. (10 marks)
B) Discuss the following :
 - i) PAM probability matrix.
 - ii) Log odds matrix. (10 marks)
4. A) What are the tools used for MSA ? Discuss. (10 marks)
B) Define Phylogeny. Discuss an algorithm used for describing the phylogenetic relationship. (10 marks)
5. A) Discuss the following :
 - i) NCBI
 - ii) EBI. (10 marks)
B) Discuss the procedures to access the Bioinformatics databases. (10 marks)

6. A) What is Knuth Morris Pratt (KMP) algorithm ? Explain with an example. (10 marks)
- B) Write short notes on :
- i) Protein Sequence database.
 - ii) Genome database.
- (10 marks)
7. A) How do you measure the evolutionary relationship of an organism with a Bioinformatics tool ? Explain with an example. (10 marks)
- B) Discuss the differences between PAM and BLOSUM. (10 marks)
- [$5 \times 20 = 100$ marks]

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**THIRD SEMESTER M.C.A. DEGREE (REGULAR) EXAMINATION
NOVEMBER 2021**

M.C.A.

MCA 20 305 A—INTERNET OF THINGS
(2020 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

Each question carries 20 marks.

1. A) Explain the role of sensors in IoT with suitable example use cases. (10 marks)
B) How IoT system helps to build Artificial Intelligent based applications ? Explain. (10 marks)
2. Write short note on :
 - a) BACNet Protocol.
 - b) Cellular Internet access protocol.
 - c) KNX.
 - d) IEEE 802.15 standard.(4 × 5 = 20 marks)
3. A) Explain WoT and its architecture. How is it different from IoT ? (10 marks)
B) Explain Cloud computing and Mobile Cloud computing. (10 marks)
4. A) Explain the concept of decentralized searching in Milgram Small world phenomenon.
B) Explain different modeling techniques for defusing a new behavior through network. (10 + 10 = 20 marks)
5. A) Explain how IoT can improve autonomy and agility in collaborative production environment. (10 marks)
B) Write Note on IoT Application in Smart grid and Smart Home. (10 marks)
6. A) Explain : i) Sensor Network ii) Body Area Network. (2 × 5 = 10 marks)
B) Write short note on : i) M2M Protocol and ii) RFID Protocol. (2 × 5 = 10 marks)
7. A) Explain the IPV6 in the context of IoT. Bring out the major advantages of IPV6 over IPV4. (10 marks)
B) Explain how IoT system can be considered as a major fuel to data science based applications. (10 marks)

**THIRD SEMESTER M.C.A. DEGREE (REGULAR) EXAMINATION
NOVEMBER 2021**

M.C.A.

MCA 20 304 D—OPERATION RESEARCH

(2020 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

Each question carries 20 marks.

1. A) Define a linear programming problem. What are the limitations of LP problem ? (10 marks)
- B) Suppose a furniture company makes chairs and tables only. Each chair gives a profit of Rs. 20 whereas each table gives Rs. 30. Both products are processed by three machines M1, M2 and M3. Each chair requires 3 hours, 5 hours and 2 hours on M1, M2 and M3 respectively. Whereas the corresponding figures for each table are 3 hours, 2 hours and 6 hours respectively. The machine M1 can work for 36 hours per week, whereas M2 and M3 can work for 50 hours and 60 hours. Solve the above problem by graphical method. (10 marks)
2. A) Obtain the optimum solution to the following transportation problem to minimize the total transportation cost. Initial solution by Vogel's approximation method. (VAM) :

		Destination				Supply
Origin		D ₁	D ₂	D ₃	D ₄	
	O ₁	42	48	38	37	16
	O ₂	40	49	52	51	15
	O ₃	39	38	40	43	19
	Demand	8	9	11	16	(10 marks)

- B) What is minimum spanning tree algorithm ? Explain any one algorithm with example. (10 marks)
3. A) Solve the following LPP by the revised simplex method :

Maximize $z = 6x_1 - 2x_2 + 3x_3$
 subject to $2x_1 - x_2 + 2x_3 \leq 2$
 $x_1 + 4x_3 \leq 4$,
 and $x_1, x_2, x_3 \geq 0$.

(10 marks)

Turn over

B) Solve the following LP problem :

$$\text{Maximize } z = (3 - 6t)x_1 + (2 - 2t)x_2 + (5 + 5t)x_3$$

$$\text{subject to } x_1 + 2x_2 + x_3 \leq 40$$

$$3x_1 + 2x_3 \leq 60$$

$$x_1 + 4x_2 \leq 30$$

$$\text{and } x_1, x_2, x_3 \geq 0.$$

(10 marks)

4. A) Solve the following integer programming problem by cutting plane method :

$$\text{Maximize } Z = 3x_1 + 4x_2$$

$$\text{subject to } 2x_1 + x_2 \leq 6$$

$$2x_1 + 3x_2 \leq 9$$

$$\text{and } x_1, x_2 \geq 0 \text{ and integers.}$$

(10 marks)

B) Jobco shop has 10 outstanding jobs to be processed on a single machine. The following table provides processing times and due dates. All times are in days and due time is measured from time 0 :

Job	Processing time	Due time
1	10	20
2	3	98
3	13	100
4	15	34
5	9	50
6	22	44
7	17	32
8	30	60
9	12	80
10	16	150

If job precedes job 3, then job 9 must precede job 7. The objective is to process all ten jobs in the shortest possible time. Formulate the model as an ILP and determine the optimum solution.

(10 marks)

5. A) Solve the following problem by Dynamic programming :

$$\text{Maximize } z = (y_1 + 2)^2 + y_2 y_3 + (y_4 - 5)^2$$

$$\text{subject to } y_1 + y_2 + y_3 + y_4 \leq 5$$

$$y_i \geq 0 \text{ and integer, } i = 1, 2, 3, 4.$$

(10 marks)

B) Neon lights on the U of A campus are replaced at the rate 100 units per day. The physical plant orders the neon lights periodically. It costs \$100 to initiate a purchase order. A neon light kept in storage is estimated to cost about \$0.02 per day. The lead time between placing and receiving an order is 12 days. Determine the optimal inventory policy for ordering the neon lights. (10 marks)

6. A) Discuss the conditions in the simplex table under which a given linear programming problem has :

- (i) No optimal solution ;
- (ii) Unique optimal solution ; and
- (iii) Multiple optimal solution.

(10 marks)

B) Solve the following LPP by Simplex Method :

$$\text{Maximize } Z = 3x_1 + 5x_2 + 4x_3$$

$$\text{subject to } 2x_1 + 3x_2 \leq 8$$

$$2x_2 + 5x_3 \leq 10$$

$$3x_1 + 2x_2 + 4x_3 \leq 15$$

$$\text{and } x_1, x_2, x_3 \geq 0.$$

(10 marks)

7. Explain the following :

- (i) Travelling salesman problem ;
- (ii) GOMORY's cutting plane algorithm ;
- (iii) Unbalanced assignment problem ; and
- (iv) Goal Programming.

(20 marks)

[5 × 20 = 100 marks]

**THIRD SEMESTER M.C.A. DEGREE (REGULAR) EXAMINATION
NOVEMBER 2021**

M.C.A.

MCA 20 304 C—CYBER SECURITY

(2020 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

Each question carries 20 marks.

1. (A) Explain the concepts involved in security certification and security auditing in cyber networks.
(B) Explain the necessity and functional aspects of Firewalls and Honey Pots.
2. (A) Explain the emerging technologies involved in applying trust in mobile and wireless networks.
(B) Explain with necessary examples a network disaster Recovery system.
3. (A) Explain Integer overflow in secure coding.
(B) Describe Ethical hacking with Reconnaissance and Enumeration.
4. (A) What is session management ? Explain weaknesses in session Token Generation with examples.
(B) Explain any one Cloud delivery model with its advantages and applications.
5. (A) Explain finger representation and finger image interpretation method for biometric security.
(B) Explain any two Face image representation and interpretation algorithms used for security.
6. (A) Describe the human factors involved in cyber security with Email and Internet use policies.
(B) Explain and compare Instant Messaging security systems and Net Privacy Systems
7. (A) Write Short Notes on : (i) Software security ; and (ii) Hacking fundamentals.
(B) Explain Virtualization security management with virtual threats.

(5 × 20 = 100 marks)

**THIRD SEMESTER M.C.A. DEGREE (REGULAR) EXAMINATION
NOVEMBER 2021**

M.C.A.

MCA 20 304 B—DIGITAL IMAGE PROCESSING

(2020 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

Each question carries 20 marks.

1. A Explain sampling and quantization techniques with suitable examples.
- B Obtain histogram equalization of the following 8-bit image segment of size 5×5 .

$$\begin{pmatrix} 200 & 200 & 200 & 180 & 240 \\ 180 & 180 & 180 & 180 & 190 \\ 190 & 190 & 190 & 190 & 180 \\ 190 & 200 & 220 & 220 & 240 \\ 230 & 180 & 190 & 210 & 230 \end{pmatrix}.$$

Also write inference on image segment before and after histogram equalization.

2. A Give an account on High-pass and Low-pass filters in frequency domain.
- B Explain any two smoothing and sharpening filters.
3. A What are the different noise models ? Explain each one.
- B Explain the geometric mean filter used for image restoration process. Also list its advantages and disadvantages.
4. A Explain the fundamental concepts of image compression.
- B Explain the different types of morphological operations with illustration.
5. A Give an account on various edge detection operations.
- B Describe any two region based image segmentation techniques.
6. A Explain about different pixel connectivity of a digital image with illustrations.
- B Explain about Hit-or-Miss transformation.
7. A Give an account on two-dimensional Fourier transform.
- B Describe various thresholding-based image segmentation methods. Explain any one global threshold detection method.

($5 \times 20 = 100$ marks)

**THIRD SEMESTER M.C.A. DEGREE (REGULAR) EXAMINATION
NOVEMBER 2021**

M.C.A.

MCA 20 304 A—BIG DATA TECHNOLOGIES

(2020 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

Each question carries 20 marks.

1. A) What are the characteristics of Big data ? Explain. (10 marks)
B) Give an account on document databases and spatial databases. (10 marks)
2. A) What are the four types of techniques used for Data Analysis ? Explain each type.
B) How does Big data analytics work ? Write the key Big Data analytics technologies and tools.
(10 + 10 = 20 marks)
3. A) Explain with examples different types of operators in R. (10 marks)
B) How to pass default values for arguments in R ? Explain linear algebra operations on vectors and matrices.
(10 marks)
4. A) Explain the basic building blocks of Hadoop with a neat sketch. (10 marks)
B) Explain the role of driver code, mapper code, and reducer code within a map-reduce program model by a suitable example.
(10 marks)
5. A) How do you store and load data in Pig ? Explain with an example. (10 marks)
B) Explain the various data types supported by HiveQL with example. (10 marks)
6. A) List and explain the components of a map reduce application. (10 marks)
B) What are the different data architecture patterns in NoSQL ? Explain the "Key-value" store and "Document" store patterns with relevant examples.
(10 marks)
7. A) How a secondary name node differs from the name node in HDFS ? Explain. (10 marks)
B) Discuss the functions of each of the five layers in Big Data architecture design. (10 marks)

**THIRD SEMESTER M.C.A. DEGREE (REGULAR) EXAMINATION
NOVEMBER 2021**

M.C.A.

MCA 20 303—PRINCIPLES OF COMPILERS

(2020 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

*Answer any five full questions.**Each question carries 20 marks.*

1. (A) Discuss about the design of Lexical Analyzers with its implementation.
(B) Prove that the given regular expression are equivalent by showing that the minimum state DFA'S are same : i) $(a^*/b^*)^*$.

(10 + 10 = 20 marks)

2. (A) Show that following grammar is LR (1) but not LALR :

$$S \rightarrow Aac | Bc | bBa$$

$$A \rightarrow d$$

$$B \rightarrow d.$$

- (B) Explain the working principle of a predictive parser with its schematic representation.

(10 + 10 = 20 marks)

3. (A) Write the translation scheme to generate three address code for the assignment statement.
(B) Give syntax directed definition to differentiate expressions formed by applying the arithmetic operators + and * to the variable x and constants, expression :

$$x^*(3^*x + x^*x).$$

(10 + 10 = 20 marks)

4. (A) For the following 'C' program, show the details of the activation records, if :

- i) Stack allocation is used
- ii) Heap allocation is used

```
main ()
{
    int * p;
    P = fun ();
}

int * fun ()
{
    int i = 23;
    return & i;
}
```

(B) Explain the different storage allocation strategies with an example.

(10 + 10 = 20 marks)

5. (A) Generate code for the following : i) $x = f(a) + f(a) + f(a)$; ii) $x = f(f(a))$; and iii) $x = ++f(a)$; and iv) $x = f(a)/g(b, c)$.

(B) Explain how dataflow equations are setup and solved for improving code.

(10 + 10 = 20 marks)

6. (A) Explain the working of different phases of a compiler. Illustrate with a source language statement.

(B) Construct predictive parser for the following grammar :

$S \rightarrow (L) / a$
 $L \rightarrow L, S/S.$

7. (A) Define the following and show an example for each :

- i) Three-address code ; ii) Triples ; iii) Quadruples ; and iv) Indirect triples.

(B) Explain various issues in the design of the code generation.

(10 + 10 = 20 marks)

[5 × 20 = 100 marks]

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**THIRD SEMESTER M.C.A. DEGREE (REGULAR) EXAMINATION
NOVEMBER 2021**

M.C.A.

**MCA 20 302—CRYPTOGRAPHY AND NETWORK SECURITY
(2020 Syllabus Year)**

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

Each question carries 20 Marks.

1. A What is OSI security architecture ? Explain its needs and benefits. (10 marks)
B Discuss about symmetric encryption scheme with a diagram. (10 marks)
2. A Write the Euclidean algorithm to find the GCD of two numbers. Also find the GCD (1970, 1066) using Euclidean algorithm. (15 marks)
B What are the fundamental theorems of arithmetic ? Explain. (5 marks)
3. A Explain the block cipher modes of operations in detail. (10 marks)
B Explain Diffie-Hellman key exchange algorithm. (10 marks)
4. A Explain how hash functions are useful for message authentication. (10 marks)
B Discuss about Digital Signature Standards. (10 marks)
5. A Explain about transport layer security. (10 marks)
B Describe the need and characteristics of firewall. (10 marks)
6. A Discuss any four Substitution Technique and list their merits and demerits. (10 marks)
B Explain the steps involved in Secure Electronic transaction in detail. (10 marks)
7. A Explain in detail about working of AES. (10 marks)
B What is Kerberos ? Explain how it provides authenticated service. (10 marks)

[$5 \times 20 = 100$ marks]

**THIRD SEMESTER M.C.A. DEGREE (REGULAR) EXAMINATION
NOVEMBER 2021**

M.C.A.

MCA 20 301—COMPUTER GRAPHICS

(2020 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

*Answer any five full questions.
Each question carries 20 marks.*

1. (A) Explain in detail about color CRT monitors with suitable diagram. (8 marks)
 (B) Give an account on flat panel devices. (8 marks)
 (C) Write a short note on video controller. (4 marks)
2. (A) Write the midpoint circle generating algorithm and explain how it works with an example. (12 marks)
 (B) Differentiate Boundary fill and Flood fill algorithm. (8 marks)
3. (A) What are the sequences of transformations to be carried out for scaling an object with respect to any selected fixed position ? Also give the diagrammatic representations. (10 marks)
 (B) Explain line clipping and text clipping algorithms with illustrations. (10 marks)
4. (A) Explain about three-dimensional transformation. (10 marks)
 (B) Discuss in detail about Back face detection method. (10 marks)
5. (A) Give an account on Key-frame systems. (10 marks)
 (B) Write a note on computer morphing. (10 marks)
6. (A) Differentiate between random scan and raster scan display devices. (10 marks)
 (B) Explain Sutherland Hodgeman polygon clipping algorithm. (10 marks)
7. (A) Derive the composite transformation matrix to align an arbitrary vector in 3-D space with the Z-axis. (10 marks)
 (B) What is Kinematics movement ? Why do we use Kinematics ? Explain the three different concepts of Kinematics. (10 marks)

[$5 \times 20 = 100$ marks]