CBCS SCHEME

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15MAT11

First Semester B.E. Degree Examination, Feb./Mar. 2022
Engineering Mathematics – I

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Find the n^{th} derivative of $e^{ax}\cos(bx + c)$ **(05 Marks)**

b. Show that the curves $r = a(1 + \cos\theta)$ and $r = b(1 - \cos\theta)$ cut orthogonally. **(05 Marks)**

c. Show that the radius of curvature at (a, 0) on the curve $y^2x = a^2(a - x)$ is a/2. **(06 Marks)**

OR

2 a. Find the n^{th} derivative of

$$\frac{x}{(x-1)^2(x+2)}$$ **(05 Marks)**

b. If $\cos^{-1}\left(\frac{y}{b}\right) = \log\left(\frac{x}{n}\right)^n$ prove that $x^2y_{n+2} + (2n + 1)xy_{n+1} + 2n^2y_n = 0$ **(06 Marks)**

c. Find the angle between the radius vector and the tangent for the curve $r^m = a^m(\cos m\theta + \sin m\theta)$ **(05 Marks)**

Module-2

3 a. Evaluate $\lim_{x \to 0} \frac{\sinh x - \sin x}{x\sin^2 x}$ **(05 Marks)**

b. If $u = \log(x^3 + y^3 + z^3 - 3xyz)$ show that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 = \frac{-9}{(x+y+z)^2}$ **(06 Marks)**

c. If $x = r\sin\theta\cos\phi$, $y = r\sin\theta\sin\phi$ and $z = r\cos\theta$ find $J = \frac{\partial(x, y, z)}{\partial(r, \theta, \phi)}$ **(05 Marks)**

OR

4 a. Obtain Maclaurin's expansion of $\log(1 + e^x)$ **(05 Marks)**

b. Evaluate $\lim_{x \to 0}\left(\frac{a^x + b^x + c^x + d^x}{4}\right)^{1/x}$ **(06 Marks)**

c. If $u = F(x - y, y - z, z - x)$ prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$. **(05 Marks)**

Module-3

5 a. A particle moves on the curve $x = 2t^2$, $y = t^2 - 4t$, $z = 3t - 5$, where t is the time. Find the components of velocity and acceleration at $t = 1$ in the direction of $\hat{i} - 3\hat{j} + 2\hat{k}$. **(05 Marks)**

b. Find the constant a, so that $\vec{F} = y(ax^2 + z)\hat{i} + x(y^2 - z^2)\hat{j} + 2xy(z - xy)\hat{k}$ is solenoidal. **(05 Marks)**

c. Prove that $\nabla \times (\phi\vec{A}) = \phi(\nabla \times \vec{F}) + (\nabla\phi) \times \vec{F}$ **(06 Marks)**

OR

6 a. Find the directional derivative of $\phi(x.y.z) = x^2yz + 4xz^2$ at the point (1, –2, –1) in the direction of the vector $2\hat{i} - \hat{j} - 2\hat{k}$. **(05 Marks)**

b. Show that the vector field $\vec{F} = (z + \sin y)\hat{i} + (x\cos y - z)\hat{j} + (x - y)\hat{k}$ is irrotational. Also find the scalar function ϕ such that $\vec{F} = \nabla\phi$. **(06 Marks)**

c. Prove that $\text{div}(\text{curl}\,\vec{F}) = 0$ **(05 Marks)**

Module-4

7 a. Obtain the reduction formula of $\int_0^{\pi/2} \sin^n x\,dx$ **(05 Marks)**

b. Solve $\dfrac{dy}{dx} + \dfrac{y\cos x + \sin y + y}{\sin x + x\cos y + x} = 0$ **(05 Marks)**

c. Show that the family of ellipses $\dfrac{x^2}{a^2+\lambda} + \dfrac{y^2}{b^2+\lambda} = 1$ is self-orthogonal. (a and b are constants and λ is parameter). **(06 Marks)**

OR

8 a. Evaluate $\int_0^{\pi} x\sin^4 x\cos^2 x\,dx$ **(05 Marks)**

b. Solve $\dfrac{dy}{dx} + x\sin 2y = x^3\cos^2 y$. **(06 Marks)**

c. Show that the family of curves $y^2 = 4a(n + a)$ is self orthogonal. **(05 Marks)**

Module-5

9 a. Find the rank of the matrix by reducing it to echelon form. Given

$$A = \begin{bmatrix} 1 & 3 & -1 & 2 \\ 0 & 11 & -5 & 3 \\ 2 & -5 & 3 & 1 \\ 4 & 1 & 1 & 5 \end{bmatrix}$$ **(05 Marks)**

b. Solve the following system of equation by Gauss-Seidel method.

$20x + y - 2z = 17$

$3x + 20y - z = -18$

$2x - 3y + 20z = 25$ **(06 Marks)**

c. Use power method to find the largest eigen value and the corresponding vector

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix},\quad X_0 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$ **(05 Marks)**

OR

10 a. Solve by Gauss elimination method

$x + 2y + z = 3$

$2x + 3y + 2z = 5$

$3x - 5y + 5z = 2$ **(05 Marks)**

b. Show that the transformation

$y_1 = 2x_1 - 2x_2 - x_3$

$y_2 = -4x_1 + 5x_2 + 3x_3$

$y_3 = x_1 - x_2 - x_3$

is regular and find the inverse transformation. **(05 Marks)**

c. Reduce the Quadratic form

$3x_1^2 + 3x_2^2 + 3x_3^3 + 2x_1x_2 + 2x_1x_3 - 2x_2x_3$ into canonical form and indicate the nature, rank, index and signature of the Quadratic form. **(06 Marks)**

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17PCD13/23

First/Second Semester B.E. Degree Examination, Feb./Mar. 2022
Programming in C and Data Structures

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. What is Pseudocode? Write a Pseudocode to find the area of a circle. **(10 Marks)**
b. What is variable? Explain how to declare and initialize a variable. **(05 Marks)**
c. What is an operator? Explain different relations operators with example. **(05 Marks)**

OR

2 a. What is an Algorithm? Write an algorithm to compute the area of rectangle. **(10 Marks)**
b. Explain the formatted Input/Output functions with its syntax and example. **(10 Marks)**

Module-2

3 a. What are the different forms of if-standard? Explain any two with syntax, flow chart and example. **(12 Marks)**
b. Write a C-program to find the sum of digits of a given integer number. **(08 Marks)**

OR

4 a. Explain switch statement with its syntax, flow chart and example. **(08 Marks)**
b. Explain the difference between while and do-while loops. **(06 Marks)**
c. Write the difference between break and continue statements. **(06 Marks)**

Module-3

5 a. What is an ARRAY? Explain the different ways of initializing an one dimensional array with an example. **(10 Marks)**
b. What is a function? Write a functional program to find the sum of two numbers. **(10 Marks)**

OR

6 a. With an example program explain different parameter passing techniques to a function. **(10 Marks)**
b. What is a string? Explain any five string handling functions? **(10 Marks)**

Module-4

7 a. What is structure? Write a program using structure to read the employee details such as employee number, name and salary of each employee and display total salary of all the employees. **(12 Marks)**
b. Explain any four file handling functions. **(08 Marks)**

OR

8 a. Explain with an example program how to pass structure to a function. (08 Marks)
b. Explain structure with in a structure with an example. (05 Marks)
c. What is a file? Explain different modes of file with an example. (07 Marks)

Module-5

9 a. What is a pointer? Explain how to declare and initialize a pointer variable. (08 Marks)
b. What is dynamic memory allocation? Explain the different dynamic memory allocation function. (08 Marks)
c. What is stack? Explain different operations performed on stack. (04 Marks)

OR

10 a. What is a Queue? Explain different operations performed on Queue. (04 Marks)
b. Explain the difference between static memory allocation and dynamic memory allocation. (08 Marks)
c. What is a macro? Write a program to find the square of a number using macros. (08 Marks)

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10CS/IS661

Sixth Semester B.E. Degree Examination, Feb./Mar. 2022
Operations Research

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO full questions from each part.***

PART – A

1 a. Define Operation Research. Explain various phases of OR. List any three limitations of OR. **(10 Marks)**

b. The standard weight of a special purpose brick is 5kg and it contains two basic ingredients B_1 and B_2. B_1 costs Rs.5/kg and B_2 costs Rs. 8/kg. Strength consideration dictate that the brick contains not more than 4kg of B_1 and a minimum of 2kg of B_2. Since the demand for the product is likely to be related to the price of the brick, find graphically the minimum cost of the brick satisfying the above conditions. **(10 Marks)**

2 a. Explain the concept of Tie breaking (Degeneracy) in simplex method. **(08 Marks)**

b. Solve by simplex method:
Maximize $Z = 3x_1 + 5x_2 + 4x_3$
Subject to: $2x_1 + 3x_2 \leq 8$
$3x_1 + 2x_2 + 4x_3 + \leq 15$
$2x_2 + 5x_3 \leq 10$
and $x_1, x_2, x_3 \geq 0$ **(12 Marks)**

3 a. Solve the following using Big M technique.
Maximize $Z = 3x_1 + 2x_2 + x_3$
Subject to: $-3x_1 + 2x_2 + 2x_3 = 8$
$-3x_1 + 4x_2 + x_3 = 7$
$x_1, x_2, x_3 \geq 0$ **(10 Marks)**

b. Solve the given LPP using two phase method:
Maximize $Z = -4x_1 - 3x_2 - 9x_3$
Subject to: $2x_1 + 4x_2 + 6x_3 \geq 15$
$6x_1 + x_2 + 6x_3 \geq 12$
$x_1, x_2, x_3 \geq 0$ **(10 Marks)**

4 a. Explain the following:
i) The essence of duality theory.
ii) Primal dual relationship. **(10 Marks)**

b. Solve the following LPP by 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)**

PART – B

5 a. Use dual simplex method to solve the following:

Maximize $Z = -3x_1 - 2x_2$

Subject to: $x_1 + x_2 \geq 1$

$x_1 + x_2 \leq 7$

$x_1 + 2x_2 \geq 10$

$x_2 \leq 3$

and $x_1, x_2 \geq 0$ **(12 Marks)**

b. Briefly discuss about sensitivity analysis. **(08 Marks)**

6 a. Find IBFS for the following transportation problem by

i) N-W method ii) LCEM method iii) VAM. **(10 Marks)**

	A_1	B_1	C_1	D_1	E_1	Supply
A	2	11	10	3	7	4
B	1	4	7	2	1	8
C	3	9	4	8	12	9
Demand	3	3	4	5	6	

(10 Marks)

b. Solve the following assignment problem:

	1	2	3	4	5
A	15	10	25	25	10
B	1	8	10	20	2
C	8	9	17	20	10
D	14	10	25	27	15
E	10	8	25	27	12

(10 Marks)

7 a. Solve the following game by using the principle of dominance:

	I	II	III	IV	V	VI
1	4	2	0	2	1	1
2	4	3	1	3	2	2
3	4	3	7	-5	1	2
4	4	3	4	-1	2	2
5	4	3	3	-2	2	2

(10 Marks)

b. Define the following:

i) Strategy
ii) Pure strategy
iii) Mixed strategy
iv) Optimal strategy
v) Zero sum game. **(10 Marks)**

8 Write short notes on:

a. Genetic algorithm
b. Metaheuristics
c. Tabu search algorithm
d. Simulated annealing algorithm. **(20 Marks)**

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