

FACULTY OF ENGINEERING
B.E. I-Year (Backlog) Examination, October 2020

Subject : Mathematics – I

Time : 2 Hours

Max. Marks: 75

PART – A

Note: Answer any seven questions.

(7x3 = 21 Marks)

- 1 Test the convergence of the series $1 - \frac{1}{3} + \frac{1}{3^2} - \frac{1}{3^3} + \frac{1}{3^4} - \dots$
- 2 Test the convergence of the series $\sum_{n=1}^{\infty} \frac{2n^3 + 5}{4n^5 + 1}$.
- 3 Verify Rolle's theorem for $f(x) = (x + 2)^3(x - 3)^4$ in $(-2, 3)$.
- 4 Find the evolute of the parabola $y^2 = 4ax$.
- 5 If $\phi(cx - az, cy - bz) = 0$, show that $\frac{a\partial z}{\partial x} + \frac{b\partial z}{\partial y} = C$.
- 6 If $u = x + 3y^2 - z^3$, $v = 4x^2yz$, $w = 2z^2 - xy$, evaluate $\frac{\partial(u, v, w)}{\partial(x, yz)}$ at $(1, -1, 0)$
- 7 Find the directional derivative of $f(x, y, z) = xy^3 + yz^3$ at the point $(2, -1, 1)$ in the direction of vector $i + 2j + 2k$.
- 8 Find $\text{div } \vec{r}$ and $\text{curl } \vec{r}$ where $\vec{r} = xi + yj + zk$.
- 9 Find the rank of $A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$.
- 10 Show that if λ is an eigen value of A , then $\frac{1}{\lambda}$ is an eigen value of A^{-1} .

PART – B

Note: Answer any three questions.

(3x18 = 54 Marks)

- 11 (a) Discuss the convergence of the series

$$1 + \frac{2!}{2^2} + \frac{3!}{3^3} + \frac{4!}{4^4} + \dots$$

- (b) Test the convergence of the series $\sum \frac{(n!)^2}{(2n!)} x^{2n}$.

- 12 (a) If $(x) = \sin^{-1}x$, $0 < a < b < 1$, use mean value theorem to prove that

$$\frac{b-a}{\sqrt{1-a^2}} < \sin^{-1}b - \sin^{-1}a < \frac{b-a}{\sqrt{1-b^2}}$$

- (b) Find the asymptotes of the curve $x^3 + 3x^2y - 4y^3 - x + y + 3 = 0$.

- 13 (a) If $x = u(1-v)$, $y = uv$, prove that $J J' = 1$.

- (b) Given $x + y + z = a$, Find the maximum value of $x^m y^n z^p$.

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- 14 Evaluate $\int_S \vec{F} \cdot d\vec{s}$ where $\vec{F} = 4xi - 2y^2j + z^2k$ and S is the surface bounding the region $x^2 + y^2 = 4$, $z = 0$ and $z = 3$.
- 15 (a) Test for consistency and solve
 $5x + 3y + 7z = 4$; $3x + 26y + 2z = 9$; $7x + 2y + 10z = 5$.
- (b) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ and express $A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I$ as linear polynomial in A.
- 16 Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to the canonical form and specify the matrix transformation.
- 17 Evaluate $\iint_A xy \, dx \, dy$ where A is the domain bounded by x-axis, ordinate $x = 2a$ and the curve $x^2 = 4ay$.

FACULTY OF ENGINEERING
BE I-Semester (CBCS) (Backlog) Examination, October 2020

Subject: Computer Programming & Problem Solving

Time: 2 Hours

Max. Marks: 70

PART – A

Note: Answer any five questions.

(5x2 = 10 Marks)

- 1) Convert 110110.11 to Decimal system.
- 2) What are variables and constants? Give examples.
- 3) Define Bitwise operators and give example.
- 4) Write a program to find factorial of a given number.
- 5) What are pre-processors? Give examples.
- 6) Define an array. Write its applications.
- 7) Write a program to add two matrices of 2 x 2 order.
- 8) What is a pointer? Write its applications.
- 9) What do you mean by a Union? Give example.
- 10) Give the description of self Referential structures.

PART – B

Note: Answer any four questions.

(4x15 = 60 Marks)

11. a) What are precedence and Associativity of Operators? Explain.
b) Discuss about type conversions with suitable example.
12. a) Write a program to find the sum of first 'n' natural numbers using for-loop.
b) Write a program to find reverse of a given number using while loop.
13. a) What is two dimensional array? Write a program to multiply two 2x2 matrices.
b) Explain about Bubble sort with example.
14. a) What are Lvalue and Rvalue? Explain about pointers to void.
b) Give the outline of string manipulations functions.
15. Explain the following
a) Structures b) Typedef statement
16. a) Differentiate between call-by-value and call-by-reference with example.
b) What are storage classes? Explain.
17. Write about
a) Files handling operations in C
b) Write a program to convert the given number into binary form.
