


| Name: | |  | |
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| Enrolment No: | | | |
| UPES Supplementary Examination, December 2023 | | | |
| Course: Remedial Mathematics Semester : I Program: Int. BMSC Microbiology/N &D/Clinical Research, BT Biomedical/Biotechnical, B.Sc. FND/Microbiology/Clinical Research | | | |
| Course Code: BP106RMT | | Duration : 3 Hours Max. Marks: 100 | |
| Instructions: All questions are compulsory. | | | |
| S. No. | Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks) | Marks | COs |
| Q 1 | The order of Matrix A is 4×4 and B is 4×3 the order of AB is: a. 1×3 b. 4×3 c. 3×3 d. 3×4 | 1.5 | CO1 |
| Q2. | The cofactor of 4 in $\begin{bmatrix} 1 & 2 & 3 \\ 5 & 4 & 2 \\ 3 & 2 & 1 \end{bmatrix}$ is: a. 0 b. -8 c. 8 d. -4 | 1.5 | CO1 |
| Q3. | Find the order of A^T if the matrix $A = \begin{pmatrix} 2 & -3 & 5 \\ 1 & 6 & 9 \end{pmatrix}$ | 1.5 | CO1 |
| Q4. | Check whether the following matrix is invertible: $\begin{bmatrix} 2 & 4 & -6 \\ 7 & 3 & 5 \\ 1 & -2 & 4 \end{bmatrix}$ | 1.5 | CO1 |
| Q5. | If $A^2 - A + I = O$ then inverse of then the inverse of A is: a. $I - A$ b. $A - I$ c. A d. $A + I$ | 1.5 | CO1 |

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| Q6. | The slope of a line $ax + by + c = 0$ is: a. $\frac{a}{b}$ b. $-\frac{a}{b}$ c. $\frac{c}{b}$ d. $-\frac{c}{b}$ | 1.5 | CO2 |
| Q7. | The lines $3x + 4y = 9$ and $6x + 8y = 15$ are parallel: a. True b. False | 1.5 | CO2 |
| Q8. | Find the distance of $(5, 12)$ from the origin. | 1.5 | CO2 |
| Q9. | Write the condition for two lines to be perpendicular. | 1.5 | CO2 |
| Q10. | $\int_0^2 (x^2 + 2) dx$ is equal to: a. $\frac{24}{3}$ b. $\frac{25}{3}$ c. $\frac{26}{3}$ d. $\frac{27}{3}$ | 1.5 | CO2 |
| Q11. | $\int_0^\pi \sin^2 x dx =$ a. $\frac{\pi}{2}$ b. $\frac{\pi}{4}$ c. 2π d. 4π | 1.5 | CO2 |
| Q12. | If $f(x) = x^4 + 5x^3 - 11x^2 - 45x + 60$ then find $f''(x)$. | 1.5 | CO3 |
| Q13. | Write the formula of $\frac{d}{dx}(uv)$ where u & v are the functions of x . | 1.5 | CO3 |
| Q14. | $\frac{d}{dx}(\sin x \cos x)$ is equal to: a. $\cos^2 x + \sin^2 x$ b. $\sin^2 x - \cos^2 x$ c. $\cos^2 x - \sin^2 x$ d. $-2\cos^2 x$ | 1.5 | CO3 |
| Q15. | If $f(x) = \frac{e^x}{x^2}$ then, $f'(1)$ is: a. e b. $-e$ c. $2e$ d. $-2e$ | 1.5 | CO3 |
| Q16. | If u & v are two functions of x then write the formula for integration of uv . | 1.5 | CO2 |
| Q17. | Integration of xe^x is given by: a. $e^x(x + 1)$ b. $-e^x(x + 1)$ | 1.5 | CO2 |

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| | c. $e^x(x - 1)$ d. xe^x | | |
| Q18. | Define upper triangular matrix. | 1.5 | CO1 |
| Q19. | Find the value of $\lim_{x \rightarrow 8} \frac{x^2 - 64}{x - 8}$ | 1.5 | CO1 |
| Q20. | The function $f(x) = x^3 - 4x^2 + 4x + 3$ defined on $[-1, 3]$ has: a. Minimum value -6 at $x = -1$ b. Minimum value 6 at $x = 3$ c. Minimum value 3 at $x = 2$ d. None of these | 1.5 | CO3 |
| Section B (4Qx5M=20 Marks) | | | |
| Attempt any 4 questions out of 5. | | | |
| Q 1 | Find the equation of a line passing through the point $(3, -2)$ and perpendicular to the line $x - 3y + 5 = 0$. | 5 | CO2 |
| Q 2 | Show that the points $A(-3, -3), B(3, 3)$ & $C(-3\sqrt{3}, 3\sqrt{3})$ are the vertices of equilateral triangle. | 5 | CO2 |
| Q 3 | Evaluate $\frac{dy}{dx}$ when $y = (3x^4e^x + 5)$ | 5 | CO3 |
| Q 4 | Evaluate the Laplace transform of $(t^2 + 4t + 2)e^{3t}$ | 5 | CO3 |
| Q 5 | Evaluate $I = \int \frac{x}{x^2 - 1} dx$ | 5 | CO3 |
| Section C (2Qx15M=30 Marks) | | | |
| All questions are compulsory Q1 has internal choice. | | | |
| Q 1 | A pharmaceutical company produces three medicines using ingredients A, B and C . One unit of P requires 1, 2 and 3 units of A, B and C respectively. One unit of Q requires 2, 3 and 2 units of A, B and C respectively. One unit of R requires 1, 2 and 2 units of A, B and C respectively. The number of units available for ingredients A, B and C are 8, 14 and 13 units respectively. Using the matrix method, determine the number of units of each medicine to produce to utilize completely the available resources. OR Bacteria increases at the rate proportional to the number of bacteria present. If the original number N doubles in 4 hours, find how many hours the number of bacteria will be $16N$. | 15 | CO4 |
| Q 2 | Evaluate the integral I using the method of partial fractions $I = \int \frac{x + 4}{(3 + 2x - x^2)} dx$ | 15 | CO3 |

Section D
(2Qx10M=20 Marks)

All questions are compulsory Q2 has internal choice.

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| Q 1 | Find the equation of the line which passes through the point (3, 4) and the sum of its intercept on the axes is 14. | 10 | CO2 |
| Q 2 | Apply Cramer's rule to solve the following system of equations: $x + y + z = 6$ $y + 3z = 11$ $x - 2y + z = 0$ <p style="text-align: center;">OR</p> Determine whether the matrix A is invertible or not. If it is invertible then apply adjoint method to find the inverse of matrix A : $A = \begin{bmatrix} 2 & 6 & 3 \\ 4 & -1 & 3 \\ 1 & 3 & 2 \end{bmatrix}$ | 10 | CO1 |