


Name:			
Enrolment No:			
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, December 2022			
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	If $A = \begin{bmatrix} 2 & 4 \\ a & -5 \\ 3 & d \end{bmatrix}$ and $B = \begin{bmatrix} 2 & b \\ 1 & -c \\ 3 & 2 \end{bmatrix}$ are equal, then the value of a, b, c, d is: a. $a = 1, b = 4, c = 5, d = 2$ b. $a = 1, b = 4, c = -5, d = 2$ c. $a = 1, b = 4, c = 5, d = -2$ d. $a = -1, b = 4, c = 5, d = 2$	1.5	CO1
Q2.	A matrix contains 48 elements then which of the following cannot be the number of rows: a. 16 b. 18 c. 8 d. 24	1.5	CO1
Q3.	Find the cofactor of 3 in the matrix $A = \begin{pmatrix} 2 & 5 & -6 \\ 4 & 3 & 0 \\ 1 & 0 & -2 \end{pmatrix}$	1.5	CO1
Q4.	For matrices $A = \begin{pmatrix} 2 & -3 \\ 0 & 2 \\ 7 & -2 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & -2 & 0 \\ 5 & 1 & 2 \end{pmatrix}$, which of the following is the matrix $3(A^T + 2B)$? a. $\begin{pmatrix} 12 & 12 & 21 \\ 21 & -12 & -6 \end{pmatrix}$ b. $\begin{pmatrix} 4 & 7 \\ -4 & 4 \\ 7 & 2 \end{pmatrix}$	1.5	CO1

	<p>c. $\begin{pmatrix} 12 & -12 & 21 \\ 21 & 12 & 6 \end{pmatrix}$</p> <p>d. The matrix is undefined</p>		
Q5.	<p>The value of resultant matrix multiplication $\begin{pmatrix} 7 & 5 & 3 \end{pmatrix} \begin{pmatrix} 7 \\ 3 \\ 2 \end{pmatrix}$ is:</p> <p>a. 70</p> <p>b. 49</p> <p>c. 15</p> <p>d. 6</p>	1.5	CO1
Q6.	<p>Two lines $3x - y + 4 = 0$ and $ax + 2y - 3 = 0$ are parallel, then a is equal to:</p> <p>a. -3</p> <p>b. -6</p> <p>c. -0.5</p> <p>d. 3</p>	1.5	CO2
Q7.	<p>Which point is on the line $3x - 5y - 9 = 0$</p> <p>a. $(-4, -1)$</p> <p>b. $(1, -2)$</p> <p>c. $(-3, -2)$</p> <p>d. $(-2, -3)$</p>	1.5	CO2
Q8.	<p>Which line is parallel to the line $x - 6 = 0$?</p> <p>a. $x = -2$</p> <p>b. $y = 5$</p> <p>c. $y = 2x + 3$</p> <p>d. $y - 1 = 0$</p>	1.5	CO2
Q9.	<p>What is the y intercept of the line $5x - 3y + 30 = 0$?</p>	1.5	CO2
Q10.	<p>What is the slope of the line $-5x + 8y - 2 = 0$?</p>	1.5	CO2
Q11.	<p>If $f(x) = \log e^{\tan x}$ then $f'(x) = ?$</p>	1.5	CO3
Q12.	<p>Second derivative of $\cos x$ is given by:</p> <p>a. $-\sin x$</p> <p>b. $\sin x$</p> <p>c. $\cos x$</p> <p>d. $-\cos x$</p>	1.5	CO3
Q13.	<p>If $x = \sin \theta$, $y = \cos \theta$, then $\frac{dy}{dx} = ?$</p>	1.5	CO3
Q14.	<p>Evaluate $I = \int \left(x^2 + \frac{2}{x^3} - 7 \right) dx$</p>	1.5	CO3
Q15.	<p>$\int 4^x dx = ?$</p> <p>a. $4^x \log 4 + c$</p> <p>b. $\frac{4^x}{\log 4} + c$</p> <p>c. $\frac{4^{x+1}}{x+1} + c$</p> <p>d. none</p>	1.5	CO3
Q16.	<p>Laplace transform of $t \cdot \sin at$ is given by:</p>	1.5	CO3

	a. $\frac{2s}{(s^2-a^2)}$ b. $\frac{2s}{(s^2+a^2)}$ c. $\frac{2as}{(s^2+a^2)}$ d. $\frac{2}{(s^2+a^2)}$		
Q17.	What is the Laplace transform of t^2 ?	1.5	CO3
Q18.	Find the value of $\lim_{x \rightarrow 1} \frac{x^3-1}{x-1}$	1.5	CO1
Q19.	If $\log_{10}(x-3) + \log_{10}x = \log_{10}10$ then the value of x is given by: a. 2 b. 1 c. 10 d. 5	1.5	CO1
Q20.	Define triangular matrix with the help of an example.	1.5	CO1
Section B (4Qx5M=20 Marks) Attempt any 4 questions			
Q 1	Determine the value of x if the distance between the points $(x, -1)$ and $(3, 2)$ is 5.	5	CO2
Q 2	Find the equation of a line which passes through the point $(-2, 3)$ and makes an angle of 30° with the positive direction of the x -axis.	5	CO2
Q 3	Evaluate $\frac{dy}{dx}$ when $y = \cos\sqrt{x} \log \sin x$	5	CO3
Q 4	Evaluate the Laplace transform of $(t^2 + 4t + 2)e^{3t}$	5	CO3
Q 5	Apply the rule of integration by substitution to evaluate $I = \int 2x^3 \sqrt{(x^2 + 4)} dx$	5	CO3
Section C (2Qx15M=30 Marks)			
Q 1	The total number of units of three products $P = 8, Q = 50$ & $R = 0$ that processed by three machines A, B and C is given by the matrix $\begin{matrix} & A & B & C \\ P & \begin{bmatrix} 2 & 2 & 2 \end{bmatrix} \\ Q & \begin{bmatrix} 3 & 5 & 7 \end{bmatrix} \\ R & \begin{bmatrix} 4 & 2 & -2 \end{bmatrix} \end{matrix}$ Determine the time taken by each machine to process the product P, Q and R . OR	15	CO4

	In a culture, bacteria increase at the rate proportional to the number of bacteria present. If there are 200 bacteria initially and are doubled in 4 hours, find the number of bacteria present 9 hours later. ($2^{\frac{9}{4}} = 4.76$)		
Q 2	Evaluate the integral I using the method of partial fractions $I = \int \frac{3x - 2}{(x - 1)^2(x + 3)} dx$	15	CO3
Section D (2Qx10M=20 Marks)			
Q 1	Find the ratio in which the line $3x + y - 9 = 0$ divides the line segment joining $A(1, 3)$ and $B(2, 7)$.	10	CO2
Q 2	Without expanding the determinant show that $\begin{vmatrix} b + c & bc & b^2c^2 \\ c + a & ca & c^2a^2 \\ a + b & ab & a^2b^2 \end{vmatrix} = 0$ OR 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