


Name:			
Enrolment No:			
<b>UNIVERSITY OF PETROLEUM AND ENERGY STUDIES</b> <b>End Semester Examination, December 2022</b>			
<b>Course:</b> Remedial Mathematics <b>Semester :</b> I <b>Program:</b> Int. BMSC Microbiology/N &D/Clinical Research, BT Biomedical/Biotechnical, B.Sc. FND/Microbiology/Clinical Research			
<b>Course Code:</b> BP106RMT		<b>Duration : 3 Hours</b> <b>Max. Marks: 100</b>	
<b>Instructions: All questions are compulsory</b>			
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. <math>\begin{pmatrix} 12 &amp; -12 &amp; 21 \\ 21 &amp; 12 &amp; 6 \end{pmatrix}</math></p> <p>d. The matrix is undefined</p>		
<b>Q5.</b>	<p>The value of resultant matrix multiplication <math>(7 \ 5 \ 3) \begin{pmatrix} 7 \\ 3 \\ 2 \end{pmatrix}</math> is:</p> <p>a. 70</p> <p>b. 49</p> <p>c. 15</p> <p>d. 6</p>	<b>1.5</b>	<b>CO1</b>
<b>Q6.</b>	<p>Two lines <math>3x - y + 4 = 0</math> and <math>ax + 2y - 3 = 0</math> are parallel, then <math>a</math> is equal to:</p> <p>a. -3</p> <p>b. -6</p> <p>c. -0.5</p> <p>d. 3</p>	<b>1.5</b>	<b>CO2</b>
<b>Q7.</b>	<p>Which point is on the line <math>3x - 5y - 9 = 0</math></p> <p>a. <math>(-4, -1)</math></p> <p>b. <math>(1, -2)</math></p> <p>c. <math>(-3, -2)</math></p> <p>d. <math>(-2, -3)</math></p>	<b>1.5</b>	<b>CO2</b>
<b>Q8.</b>	<p>Which line is parallel to the line <math>x - 6 = 0</math> ?</p> <p>a. <math>x = -2</math></p> <p>b. <math>y = 5</math></p> <p>c. <math>y = 2x + 3</math></p> <p>d. <math>y - 1 = 0</math></p>	<b>1.5</b>	<b>CO2</b>
<b>Q9.</b>	<p>What is the <math>y</math> intercept of the line <math>5x - 3y + 30 = 0</math> ?</p>	<b>1.5</b>	<b>CO2</b>
<b>Q10.</b>	<p>What is the slope of the line <math>-5x + 8y - 2 = 0</math> ?</p>	<b>1.5</b>	<b>CO2</b>
<b>Q11.</b>	<p>If <math>f(x) = \log e^{\tan x}</math> then <math>f'(x) = ?</math></p>	<b>1.5</b>	<b>CO3</b>
<b>Q12.</b>	<p>Second derivative of <math>\cos x</math> is given by:</p> <p>a. <math>-\sin x</math></p> <p>b. <math>\sin x</math></p> <p>c. <math>\cos x</math></p> <p>d. <math>-\cos x</math></p>	<b>1.5</b>	<b>CO3</b>
<b>Q13.</b>	<p>If <math>x = \sin \theta</math>, <math>y = \cos \theta</math>, then <math>\frac{dy}{dx} = ?</math></p>	<b>1.5</b>	<b>CO3</b>
<b>Q14.</b>	<p>Evaluate <math>I = \int \left( x^2 + \frac{2}{x^3} - 7 \right) dx</math></p>	<b>1.5</b>	<b>CO3</b>
<b>Q15.</b>	<p><math>\int 4^x dx = ?</math></p> <p>a. <math>4^x \log 4 + c</math></p> <p>b. <math>\frac{4^x}{\log 4} + c</math></p> <p>c. <math>\frac{4^{x+1}}{x+1} + c</math></p> <p>d. none</p>	<b>1.5</b>	<b>CO3</b>
<b>Q16.</b>	<p>Laplace transform of <math>t \cdot \sin at</math> is given by:</p>	<b>1.5</b>	<b>CO3</b>

	a. $\frac{2s}{(s^2-a^2)}$ b. $\frac{2s}{(s^2+a^2)}$ c. $\frac{2as}{(s^2+a^2)}$ d. $\frac{2}{(s^2+a^2)}$		
<b>Q17.</b>	What is the Laplace transform of $t^2$ ?	<b>1.5</b>	<b>CO3</b>
<b>Q18.</b>	Find the value of $\lim_{x \rightarrow 1} \frac{x^3-1}{x-1}$	<b>1.5</b>	<b>CO1</b>
<b>Q19.</b>	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	<b>1.5</b>	<b>CO1</b>
<b>Q20.</b>	Define triangular matrix with the help of an example.	<b>1.5</b>	<b>CO1</b>
<b>Section B</b> <b>(4Qx5M=20 Marks)</b> <b>Attempt any 4 questions</b>			
<b>Q 1</b>	Determine the value of $x$ if the distance between the points $(x, -1)$ and $(3, 2)$ is 5.	<b>5</b>	<b>CO2</b>
<b>Q 2</b>	Find the equation of a line which passes through the point $(-2, 3)$ and makes an angle of $30^\circ$ with the positive direction of the $x$ -axis.	<b>5</b>	<b>CO2</b>
<b>Q 3</b>	Evaluate $\frac{dy}{dx}$ when $y = \cos\sqrt{x} \log \sin x$	<b>5</b>	<b>CO3</b>
<b>Q 4</b>	Evaluate the Laplace transform of $(t^2 + 4t + 2)e^{3t}$	<b>5</b>	<b>CO3</b>
<b>Q 5</b>	Apply the rule of integration by substitution to evaluate $I = \int 2x^3 \sqrt{x^2 + 4} dx$	<b>5</b>	<b>CO3</b>
<b>Section C</b> <b>(2Qx15M=30 Marks)</b>			
<b>Q 1</b>	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 $R$ . <b>OR</b>	<b>15</b>	<b>CO4</b>

	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. ( $2^{\frac{9}{4}} = 4.76$ )		
<b>Q 2</b>	Evaluate the integral $I$ using the method of partial fractions $I = \int \frac{3x - 2}{(x - 1)^2(x + 3)} dx$	<b>15</b>	<b>CO3</b>
<b>Section D</b> (2Qx10M=20 Marks)			
<b>Q 1</b>	Find the ratio in which the line $3x + y - 9 = 0$ divides the line segment joining $A(1, 3)$ and $B(2, 7)$ .	<b>10</b>	<b>CO2</b>
<b>Q 2</b>	Without expanding the determinant show that $\begin{vmatrix} b + c & bc & b^2c^2 \\ c + a & ca & c^2a^2 \\ a + b & ab & a^2b^2 \end{vmatrix} = 0$  <b>OR</b> Determine whether the matrix $A$ is invertible or not. If it is invertible then apply adjoint method to find the inverse of matrix $A$ : $A = \begin{bmatrix} 2 & 6 & 3 \\ 4 & -1 & 3 \\ 1 & 3 & 2 \end{bmatrix}$	<b>10</b>	<b>CO1</b>