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

Duration : 3 Hours

Course Code: BP106RMT

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**

	c. $\begin{pmatrix} 12 & -12 & 21 \\ 21 & 12 & 6 \end{pmatrix}$ d. The matrix is undefined		
Q5.	The value of resultant matrix multiplication $(7 \quad 5 \quad 3)\begin{pmatrix} 7 \\ 3 \\ 2 \end{pmatrix}$ is: a. 70 b. 49 c. 15 d. 6	**1.5**	**CO1**
Q6.	Two lines $3x - y + 4 = 0$ and $ax + 2y - 3 = 0$ are parallel, then a is equal to: a. -3 b. -6 c. -0.5 d. 3	**1.5**	**CO2**
Q7.	Which point is on the line $3x - 5y - 9 = 0$ a. $(-4, -1)$ b. $(1, -2)$ c. $(-3, -2)$ d. $(-2, -3)$	**1.5**	**CO2**
Q8.	Which line is parallel to the line $x - 6 = 0$? a. $x = -2$ b. $y = 5$ c. $y = 2x + 3$ d. $y - 1 = 0$	**1.5**	**CO2**
Q9.	What is the y intercept of the line $5x - 3y + 30 = 0$?	**1.5**	**CO2**
Q10.	What is the slope of the line $-5x + 8y - 2 = 0$?	**1.5**	**CO2**
Q11.	If $f(x) = log e^{tanx}$ then $f'(x) =$?	**1.5**	**CO3**
Q12.	Second derivative of $cosx$ is given by: a. $-sinx$ b. $sinx$ c. $cosx$ d. $-cosx$	**1.5**	**CO3**
Q13.	If $x = sin\theta$, $y = cos\theta$, then $\frac{dy}{dx} =$?	**1.5**	**CO3**
Q14.	Evaluate $I = \int \left(x^2 + \frac{2}{x^3} - 7\right) dx$	**1.5**	**CO3**
Q15.	$\int 4^x \, dx =$? a. $4^x log 4 + c$ b. $\frac{4^x}{\log 4} + c$ c. $\frac{4^{x+1}}{x+1} + c$ d. none	**1.5**	**CO3**
Q16.	Laplace transform of $t.sinat$ is given by:	**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 $\lim_{x\to 1}\frac{x^3-1}{x-1}$	**1.5**	**CO1**
Q19.	If $log_{10}(x-3)+log_{10}x=log_{10}10$ then the value is 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 $30^{\circ}$with the positive direction of the x-axis.	**5**	**CO2**
Q 3	Evaluate $\frac{dy}{dx}$ when $y=cos\sqrt{x}\log sinx$	**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 $\begin{matrix} & A & B & C \\ P & & & \\ Q & & & \\ R & & & \end{matrix}\begin{bmatrix} 2 & 2 & 2 \\ 3 & 5 & 7 \\ 4 & 2 & -2 \end{bmatrix}$ 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**