Total No. of Questions – [4]

Total No. of Printed Pages: [3]

G.R. No.	

PAPER CODE	U113 – 201(BE)

Dec 2023 (Backlog) EXAM

F.Y. B. TECH. (PATTERN 2018)

COURSE NAME: Engineering Mathematics I

COURSE CODE: ES11181

[Max. Marks: 60]

Time: [2Hr]

(*) Instructions to candidates:

1) **Use of scientific calculator is allowed**
2) **Use suitable data where ever required**
3) **All questions are compulsory**

Que. No.	Question Description	Max. Marks	CO mapped	BT Level
Q1.	**Choose the Correct options**			
	I) Rank of the matrix $\begin{bmatrix}1 & 1 & 1\\2 & 2 & 2\\3 & 3 & 3\end{bmatrix}$ is a) 1 b) 2 c)3 d) None of these	**[2]**	CO1	Understand
	ii) If A is an Skew symmetric matrix of order 7 by 7 then which of the following statement is correct a) Rank of matrix= 7 b) Rank of matrix > 7 c) Rank of matrix < 7 d) None of these	**[2]**	CO1	Remember
	iii)The rank of matrix $A = \begin{bmatrix}1 & 0 & 0\\0 & 3 & 0\\0 & 0 & 2\end{bmatrix}$ is A) 0 B) 1 C)3 D) 2	**[2]**	CO1	Remember
	iv) Non-homogeneous system of linear equations A X = B is consistent if a)$\rho(A) = \rho(A\|B)$ b) $\rho(A) \neq \rho(A\|B)$ c) ρ(A)>number of unknown d) none of these	**[2]**	CO1	Remember
	v) The rank of matrix $A = \begin{bmatrix}1 & 1 & 1\\0 & 0 & 0\\0 & 0 & 0\end{bmatrix}$ is A) 0 B) 1 C)3 D) 2	**[2]**	CO1	Understand

	vi) Series expansion of $\cos x$ is a) $1+\frac{x^2}{2!}+\frac{x^4}{4!}+\frac{x^6}{6!}+\cdots\ldots\ldots$ b) $1-\frac{x^2}{2!}+\frac{x^4}{4!}-\frac{x^6}{6!}+\cdots\ldots\ldots$ c) $1+\frac{x^2}{2}+\frac{x^4}{4}+\frac{x^6}{6}+\cdots\ldots\ldots$ d) $1-\frac{x^2}{2}+\frac{x^4}{4}-\frac{x^6}{6}+\cdots\ldots\ldots$	[2]	CO2	Remember
	vii) Series expansion of $\sin x$ is a) $x+\frac{x^3}{3!}+\frac{x^5}{5!}+\frac{x^7}{7!}+\cdots\ldots\ldots$ b) $x+\frac{x^3}{3}+\frac{x^5}{5}+\frac{x^7}{7}+\cdots\ldots\ldots$ c) $x-\frac{x^3}{3!}+\frac{x^5}{5!}-\frac{x^7}{7!}+\cdots\ldots\ldots$ d) $x+x^3+x^5+x^7+\cdots\ldots\ldots$	[2]	CO2	Understand
	viii) If $f(x)=\sinh(x)$ then which one of the following is correct a) $\frac{e^x+e^{-x}}{2}$ b) $\frac{e^x+e^{-x}}{2i}$ c) $\frac{e^x-e^{-x}}{2}$ d) $\frac{e^{ix}-e^{-ix}}{2i}$	[2]		Understand
	ix) If $f(x)=\cosh(x)$ then which one of the following is correct a) $\frac{e^x+e^{-x}}{2i}$ b) $\frac{e^{ix}+e^{-ix}}{2}$ c) $\frac{e^x-e^{-x}}{2}$ d) $\frac{e^x+e^{-x}}{2}$	[2]	CO2	Understand
	x) If $f(x)=\tanh(x)$ then which one of the following is correct a) $\frac{e^x+e^{-x}}{2i}$ b) $\frac{e^{ix}+e^{-ix}}{2}$ c) $\frac{e^x-e^{-x}}{2}$ d) $\frac{e^x+e^{-x}}{2}$	[2]	CO3	Understand
	xi) The product of an odd and an even function is (a) odd function (b)even function (c) Neither even nor odd function (d) none of these	[2]	CO3	Understand
	xii) The product of an odd and an odd function is (a) odd function (b)even function (c) Neither even nor odd function (d) none of these	[2]	CO3	Understand
	xiii) The period of a constant function is (a) 2π (b) π (c) 0 (d) Not defined	[2]	CO3	Understand
	xiv) The period of a sine function is (a) 2π (b) π (c) 0 (d) Not defined	[2]	CO3	Remember
	xv) The value of a_0 in the Fourier series of $f(x)=x\sin x$ in $0< x< 2\pi$ is A) 0 B) 1 C) 2 D) -2	[2]	CO3	Remember

Q. 2	Attempt any two of the following			
	a) If $u = \left(\frac{x^2y^2z^2}{x^2+y^2+z^2}\right)$ then find $xu_x + yu_y + zu_z$	**[5]**	CO4	Apply
	b) $u = \text{cosec}^{-1}\left(\frac{\sqrt{x}+\sqrt{y}}{\sqrt[3]{x}+\sqrt[3]{y}}\right)$ then find $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$	**[5]**	CO4	Apply
	c) If $u = \tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$ then find $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$	**[5]**	CO4	Apply
Q. 3	Attempt any two of the following			
	a) If $f(x,y) = xy\,(a-x-y)$ then find stationary points	**[5]**	CO5	Understand
	b) $u = x^2 - y^2$ and $v = 2xy$ then find $\frac{\partial(u,v)}{\partial(x,y)}$	**[5]**	CO5	Understand
	c)Find Maximum value of $f(x,y) = x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$	**[5]**	CO5	Understand
Q. 4	Attempt any two of the following			
	a) Evaluate: $\int_0^{\pi/2} \sqrt{\tan\theta}\, d\theta$	**[5]**	CO6	Understand
	b) Evaluate: $\int_0^{\infty} e^{-x} x^4\, dx$	**[5]**	CO6	Understand
	c) Evaluate: $\int_0^{\infty} \frac{dx}{1+x^4}\, dx$	**[5]**	CO6	Understand