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**BTECH**  
**(SEM II) THEORY EXAMINATION 2021-22**  
**ENGINEERING MATHEMATICS-II**

Time: 3 Hours

Total Marks:100

Notes:-

- Attempt all sections and assume any missing data.
- Appropriate marks are allotted to each question, answer accordingly.

SECTION -A	Attempt all of following questions in brief	Marks (10×2=20)	CO
Q.14(a)	Find the inverse of the matrix $A = \begin{bmatrix} 4 & 3 \\ 5 & 7 \end{bmatrix}$ .		1
Q.14(b)	For what value of 't' the rank of the matrix $A = \begin{bmatrix} 1 & 5 & 4 \\ 0 & 3 & 2 \\ 0 & 3t & 10 \end{bmatrix}$ is 2.		1
Q.14(c)	Show that $f(z) = z + 2z$ is not analytic anywhere in the complex plane.		2
Q.14(d)	Define a harmonic function and conjugate harmonic function.		2
Q.14(e)	Find the unit normal vector to the surface $z = x^2 + y^2$ at the point (1, 1, 2).		3
Q.14(f)	Find the value of 'n' for which the vector field $\vec{v} = n(x^2y^2)\vec{i} + 4yz\vec{j} + 3z\vec{k}$ , is solenoidal.		3
Q.14(g)	Find the constant term when $f(x) = 1 +  x $ is expanded in Fourier series in the interval $(-\pi, \pi)$ .		4
Q.14(h)	State Dirichlet's condition for the expansion of $f(x)$ in Fourier series.		4
Q.14(i)	Classify: $\frac{\partial^2 u}{\partial x^2} = e^x + \frac{\partial^2 u}{\partial y^2}$ .		5
Q.14(j)	Find the general solution of $\frac{\partial z}{\partial x} = \frac{\partial z}{\partial y}$ using method of separation of variables.		5

SECTION -B	Attempt any three of the following questions	Marks (3×10=30)	CO
Q.24(a)	Find the value of k, such that the system of equations $kx + 6y + z = 0$ , $kx + 2y + kz = 0$ and $x + 4y + 2z = 0$ has non-trivial solution. Hence find the solution of the system.		1
Q.24(b)	If $f(z) = u + iv$ is an analytic function, find $f(z)$ in terms of $z$ if $u - v = \frac{e^z - \cos z + i \sin z}{\cosh z - \cos z}$ . When $f\left(\frac{1}{2}\right) = \frac{2\sqrt{2}}{3}$ .		2
Q.24(c)	Use Divergence Theorem to evaluate $\int_S \vec{F} \cdot d\vec{S}$ where $\vec{F} = 4xz\vec{i} - 2y^2\vec{j} + x^2\vec{k}$ and $S$ is the surface bounding the region $x^2 + y^2 \leq 4$ , $z = 0$ and $z = 3$ .		3
Q.24(d)	For the Fourier series for the function given by $f(x) = \begin{cases} 2t & 0 \leq t \leq 1 \\ 2(2-t) & 1 \leq t \leq 2 \end{cases}$ .		4
Q.24(e)	A tightly stretched string with fixed end points $x = 0$ and $x = l$ is initially in a position given by $y = y_0 \sin^3 \frac{\pi x}{l}$ . If it is released from rest from this position, find the displacement $y(x, t)$ .		5