SAPTHAGIRI NPS UNIVERSITY

Department of Mathematics

MODEL QUESTION PAPER-II

Semester	**:**	**1st sem B.Tech**	**Maximum marks**	**:**	**100**
Course Title	**:**	**Linear Algebra and Calculus**	**Duration**	**:**	**3 hours**
Course Code	**:**	**24BEELY102**	**(E cycle)**		

Part-A

Answer any Ten questions **10X02=20**

1	Define singular and non-singular matrix.	**02**
2	Find the rank of the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$.	**02**
3	Solve by using Gauss elimination method: $2x + 3y = 7$, $x - 2y = -3$	**02**
4	Find the n[th] derivative of x^2e^x.	**02**
5	If $y = \tan^{-1}x$, find the second order derivative.	**02**
6	Write the Pedal equation in polar form.	**02**
7	If $u = \frac{x}{y}$, then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 0$.	**02**
8	State Euler's theorem for homogeneous function of two variables.	**02**
9	If $x = rcos\theta, y = rsin\theta$, find $J\left[\frac{x,y}{r,\theta}\right]$.	**02**
10	Evaluate $\int_0^2 \int_1^2 (x^2 + y^2)\, dx\, dy$.	**02**
11	Find the integrating factor for $ydx - xdy = 0$.	**02**
12	Write the complementary function for $(D^2 + 1)y = 0$.	**02**

Part-B

Answer any seven questions **07X05=35**

13	Find the rank of the matrix $A = \begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}$	**05**
14	Solve the following system of equations by using Gauss Jordan method $2x + 3y - z = 5; 4x + 4y - 3z = 3; 2x - 3y + 2z = 2.$	**05**
15	If $y = a\cos(\log x) + b\sin(\log x)$, show that $x^2y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0.$	**05**
16	Show that the following pair of curves intersect each other orthogonally $r = a(1 + \cos\theta)$ and $r = b(1 - \cos\theta)$.	**05**

17		If $= tan^{-1}\left(\frac{y}{x}\right)$, show that $\frac{\partial^2 u}{\partial y \partial x} = \frac{\partial^2 u}{\partial x \partial y}$.	**05**
18		If $u = e^{(x^3y^3/x^2+y^2)}$, show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 4\,u \log u$.	**05**
19		Evaluate $\int_0^{\pi} \frac{sin^4\theta}{(1+cos\theta)^2} d\theta$ by using reduction formula.	**05**
20		Check whether the given differential equation is exact or not. $y\,e^{xy}dx + (xe^{xy} + 2y\,)\,dy = 0$.	**05**
21		Solve $\frac{d^3y}{dx^3} - y = 3\cos 2x$.	**05**
Part-C **Answer any Three full questions**			**03X15=45**
22	**a)**	Solve the following system of equation by Gauss-Seidel Method: $5x + 2y + z = 12;\ x + 4y + 2z = 15;\ x + 2y + 5z = 20$ by taking initial approximation as $(1, 0, 3)$.	**07**
	b)	Find the dominant eigen value and corresponding eigen vector of the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ by Rayleigh's Power Method, taking the initial eigen vector as $(1,1,1)^T$.	**08**
23	**a)**	Find the angle between the following pair of curves, $r = a\theta\ and\ r = \frac{a}{\theta}$.	**07**
	b)	Find the pedal equation of the following curves: $\frac{2a}{r} = (1 + \cos\theta)$.	**08**
24	**a)**	If $u = \frac{yz}{x}, v = \frac{zx}{y}, w = \frac{xy}{z}$, find the value of $\frac{\partial(u,v,w)}{\partial(x,y,z)}$.	**07**
	b)	If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$.	**08**
25	**a)**	Evaluate $\int_0^1 \int_0^{\sqrt{1-y^2}} x^3\, y\, dx\, dy$.	**07**
	b)	Evaluate $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} \frac{dz\, dy\, dx}{(1+x+y+z)^3}$.	**08**
26	**a)**	Solve $x^3\frac{dy}{dx} - x^2\, y = -y^4 \cos x$ by using Bernoulli's differential equation.	**07**
	b)	Solve $\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 4y = x^2 - 4x - 6$.	**08**