Hall Ticket Number:

Code No. : 12033

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (CBCS) II-Semester Main Examinations, January-2021

Engineering Mathematics-II

(Common to All branches)

Time: 2 hours Max. Marks: 60

Note: Answer any NINE questions from Part-A and any THREE from Part-B

Part-A (9 × 2 = 18 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Determine whether the vectors $(1,0,-2),(0,2,1),(3,2,-5)$ are linearly dependent.	2	4	1	1,2
2.	If $A=\begin{pmatrix}1 & 2 & 3\\ 0 & -1 & 2\\ 0 & 0 & 1\end{pmatrix}$, find the eigenvalues of the matrix $A^4-2A^2+A^{-1}-3I$.	2	2	1	1,2
3.	Find an integrating factor of $xdy-ydx+\log x\,dx=0$ and hence solve it.	2	2	2	1
4.	Obtain general and singular solutions of the Clairaut's equation $y=xy'+(y')^2$.	2	3	2	1,2
5.	Solve $\frac{d^3y}{dx^3}+8y=0$.	2	3	3	1
6.	Find a particular integral of $y''+2y'+y=e^{-x}\cos x$.	2	2	3	1
7.	Determine $\lim_{z\to 0}\frac{\text{Re}(z)}{z}$, if it exists.	2	4	4	1,2
8.	State the necessary condition for a function $f(z)$ to be analytic.	2	1	4	1
9.	Evaluate $\oint_C \frac{dz}{(z-2)^2}$, where c is $\lvert z-1\rvert=\frac{1}{2}$.	2	3	5	1,2,12
10.	State Taylor's series	2	2	5	1
11.	State Cayley-Hamilton theorem.	2	1	1	1
12.	Define exact first order differential equation.	2	1	2	1
	Part-B (3 × 14 = 42 Marks)				
13. a)	Define rank of a matrix . Find all values of k such that the rank of the matrix $A=\begin{pmatrix}k & -1 & 0 & 0\\ 0 & k & -1 & 0\\ 0 & 0 & k & -1\\ -6 & 11 & -6 & 1\end{pmatrix}$ is 3.	7	2	1	1,2

Contd... 2

b)	Diagonalize the matrix $A=\begin{pmatrix}3&2&1\\0&2&0\\1&2&3\end{pmatrix}$ using similarity transformation.	7	2	1	1,2,12
14. a)	Find the general solution of $(xy^3+y)dx+2(x^2y^2+x+y^4)dy=0$.	7	2	2	1
b)	Find the orthogonal trajectories of the family of curves $\frac{x^2}{a^2+\lambda}+\frac{y^2}{b^2+\lambda}=1, \lambda$ is a parameter.	7	2	2	1,2
15. a)	Solve $(D^4+2D^2+1)y=x\sin 2x$.	7	3	3	1
b)	Apply the method of variation of parameters to solve $y''-y=\frac{2}{1+e^x}$.	7	3	3	1,2
16. a)	Show that for the function $f(z)=\begin{cases}\frac{(\bar{z})^2}{z}, & z\neq 0\\ 0, & z=0\end{cases}$, the Cauchy – Riemann equations are satisfied at z = 0. Does $f'(0)$ exist ?	8	5	4	1,2,12
b)	Show that $u(x,y)=y^3-3x^2y$ is harmonic . Find the corresponding conjugate harmonic function $v(x,y)$ and the analytic function f(z).	6	5	4	1,2
17. a)	Use Cauchy's integral formula to evaluate $\oint_c \frac{\sin\pi z^2+\cos\pi z^2}{(z-1)^2(z-2)}dz$, where c is $\lvert z\rvert=\frac{3}{2}$.	6	3	5	1,2
b)	Expand $f(z)=\frac{1}{(z-1)(z-2)}$ in the region $1<\lvert z\rvert<2$ by using Laurent's Series	8	2	5	1,2
18. a)	Find the eigenvalues and the corresponding eigenvectors of the matrix $A=\begin{pmatrix}2&0&1\\0&2&0\\1&0&2\end{pmatrix}$.	7	2	1	1,2
b)	Solve the linear equation $(1-x^2)\frac{dy}{dx}+2xy=x\sqrt{1-x^2}$.	7	3	2	1

19.	Answer any ***two*** of the following:				
a)	Solve the initial value problem $y''' + 6y'' + 11y' + 6y = 0, y(0) = 0, y'(0) = 1, y''(0) = -1$.	7	3	3	1
b)	Find the analytic function $f(z) = u + iv$ in terms of z, if $u - v = (x - y)(x^2 + 4xy + y^2)$.	7	2	4	1,2
c)	Determine the poles and the residue at each pole of $f(z) = \frac{z^2}{(z-1)^2(z+2)}$.	7	4	5	1,2,12

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	52
2	Knowledge on application and analysis (Level-3 & 4)	42
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	6

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