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Code No. : 14111

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
B.E. (CBCS) IV-Semester Main & Backlog Examinations, May-2019

Engineering Mathematics-IV

Time: 3 hours

Max. Marks: 60

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Q.No.	Stem of the question	M	L	CO	PO
Part-A (10 × 2 = 20 Marks)					
1.	State sufficient conditions for existence of Laplace transform. Give example of a function that cannot be Laplace transformed stating the reason.	2	3	1	1
2.	Find the inverse Laplace transform $\frac{e^{-3s}}{s+2}$	2	3	1	1
3.	Compute the Fourier sine and cosine transforms of x .	2	2	1	1
4.	Given $F(e^{-x^2}) = \sqrt{\pi}e^{-s^2/4}$, find Fourier transform of $e^{-4(x-3)^2}$	2	4	2	1
5.	State Scaling and Shifting properties of Z transform	2	1	2	1
6.	Find $Z\{na^n\}$	2	2	2	1
7.	What are the sufficient conditions for a function to be analytic?	2	2	3	1
8.	Show that the function $u(r, \theta) = r^2 \cos 2\theta$ is harmonic.	2	2	3	1
9.	Obtain Taylor series of $\frac{1}{z+1}$ about $z = 1$.	2	1	3	1
10.	Define (i) zero and (ii) singular point of a function. Give one example each.	2	1	3	1
Part-B (5 × 8 = 40 Marks)					
11. a)	Solve the differential equation $y'' + y = e^t \sin t$, $y(0) = 0$, $y'(0) = 0$	5	1	1	1
b)	Derive Laplace transform of derivative of a function.	3	2	1	1
12. a)	Find the Fourier transform of $f(x) = x^2$, $ x < a$; $0, x > a$	5	2	2	1
b)	Solve the integral equation $\int_0^\infty f(x) \cos ax = e^{-a}$	3	3	2	1
13. a)	Determine f_0, f_1, f_2 in the sequence $\{f_n\}$, when $F(z) = \frac{3z^2 - 4z + 7}{(z-1)^3}$	4	2	2	1
b)	Solve $u_{n+2} - 2u_{n+1} + u_n = 3n + 5$, using Z-transforms.	4	4	2	1
14. a)	Find the analytic function $f(z) = u + iv$, if $u - v = (x - y)(x^2 + 4xy + y^2)$.	5	2	3	1
b)	Using the Cauchy integral theorem and its extension evaluate $\oint_C \frac{dz}{z(z+2)}$, where C is the rectangle containing the points $Z=0$ and $Z=-2$ inside it.	3	2	3	1
15. a)	Find the series expansion of the function $\frac{1}{(z^2-1)}$ in the region (i) $ z-1 < 2$ (ii) $ z-1 > 2$	5	4	3	1
b)	Evaluate $\oint_C \frac{e^z}{\cos \pi z} dz$, $C: z = 1$	3	4	3	1

Contd... 2

16. a) Find the inverse Laplace transform of $\frac{1}{(s^2+a^2)^2}$	4	1	1	1
b) Find $f(x)$ if its Fourier sine transform is $\frac{1}{s}e^{-as}, a > 0$	4	4	1	1
17. Answer any two of the following:				
a) Use convolution theorem to evaluate $Z^{-1}\left\{\frac{z^2}{(z-a)^2}\right\}$	4	2	2	1
b) Evaluate the integral $\oint_C \frac{e^z dz}{z^2(z+1)^3}$, where $C: z = 2$.	4	4	3	1
c) Evaluate the integral $\int_0^{2\pi} \frac{d\theta}{1-2a \cos\theta + a^2}$ where a is a complex constant and $ a < 1$.	4	3	3	1

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)	58.75
2	Knowledge on application and analysis (Level-3 & 4)	41.25
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	