Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E / B. Tech (Full Time) END SEMESTER EXAMINATIONS – NOV / DEC 2019

MANUF, CSC
Semester - II
MA9161 - Mathematics - II

(Regulation – 2002, 2004, 2008, 2012)

Time: 3 Hours | Answer ALL Questions | Max. Marks 100

PART- A (10 x 2 = 20 Marks)

Q.No	Questions	Marks
1.	Solve (D2 – 5D + 6)y = 0	2
2.	Solve $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 0$	2
3.	Find the Directional Derivative of $\varphi = x^2yz + 4xz^2$ at (1, -2, -2) in the direction of $2\vec{i} - \vec{j} - 2\vec{k}$.	2
4.	State Green's theorem.	2
5.	Examine whether the following function is analytic or not. F(x) = e-x (cos y – i sin y)	2
6.	Find the critical points of the transformation w2 = (z – α) (z – β).	2
7.	Evaluate $\int_c \frac{z\,dz}{z-2}$ where c is the circle $\|z\| = 1$	2
8.	What is the nature of the singularity z = 0 of the function $f(z) = \frac{\sin z - z}{z^3}$	2
9.	Find $L\left[\frac{\sin at}{t}\right]$	2
10.	Verify the initial value theorem for f(t) = 3 e^{-2t}	2

PART- B (5 x 16 = 80 Marks)

(Q. No 11 is Compulsory)

Q.No	Questions	Marks
11.	a)(i). Solve $(D^2 – 4D + 4)y = e^{2x}$ by the method of variation of parameters	8
	(ii). Solve the simultaneous equation Dx + y = sin2t; -x + Dy = cos2t.	8
12.	a) (i). Show that $\vec{F} = (6xy + z^3)\vec{i} + (3x^2 - z)\vec{j} + (3xz^2 - y)\vec{k}$ is irrotational vector and find the scalar potential function φ such that $\vec{F} = \nabla\varphi$.	8
	(ii) Evaluate by Green's theorem $\int_c e^{-x}(\sin y\,dx + \cos y\,dy)$, C being the rectangle with vertices (0, 0), (π, 0), (π, π/2) and (0, π/2).	8
	OR	
	b) (i) Verify Gauss Divergence Theorem for $\vec{F} = 4xz\vec{i} - y^2\vec{j} + yzk$ over the cube bounded by x = 0, x = 1, y = 0, y = 1, z = 0, z = 1.	16
13.	a) (i) If f(x) = u + iv is a regular function of z in a domain D. Show that $\nabla^2[\|f(z)\|^2] = 4\|f'(z)\|^2$	8
	(ii) Determine the analytic function where real part is $u = x^3 – 3xy^2 + 3x^2 – 3y^2 + 1$	8
	OR	
	b) (i) Find the image of the circle $\|z - 1\| = 1$ in the complex plane under the mapping w = 1/z.	8
	(ii) Find the bilinear transformation which maps the points -2, 0, 2 into the points w = 0, I, -1 respectively.	8

14.	a) (i). Obtain Laurent's expansion for $f(z) = \frac{1}{(z-1)(z-2)}$	8
	(ii) If c is the circle $\|z\| = 3$ then evaluate $\int_c \frac{\cos\pi z^2 + \sin\pi z^2}{(z+1)(z+2)} dz$	8
	OR	
	b) (i). Evaluate $\int_0^{2\pi} \frac{d\theta}{5+4\cos\theta}$.	8
	(i). Using contour integration, evaluate $\int_{-\infty}^{\infty} \frac{z\,dz}{(z+1)(z^2+1)}$	8
15.	a) (i) Find the Laplace transform of the Half wave rectifier function $f(t) = \begin{cases} \sin wt, & 0 < t < \frac{\pi}{\omega} \\ 0, & \frac{\pi}{\omega} < t < \frac{2\pi}{\omega} \end{cases}$	8
	(ii). Find $L^{-1}\left[\frac{1}{s(s+1)(s+2)}\right]$	8
	OR	
	b) (i) Using convolution theorem find $L^{-1}\left[\frac{1}{(s+a)(s+b)}\right]$	8
	(ii) Solve by using Laplace Transform. $(D^2 + 9)y = \cos 2t$, given that if $y(0) = 1$, $y(\pi/2) = -1$	8