Total No. of Questions – [08]

Total No. of Printed Pages 02

G.R. No.	

Paper Code { COMP. - U228-121 (ESE) I.T. - U228-141 (ESE)

MAY 2019/ END-SEM

S. Y. B. TECH. (COMPUTER/IT ENGINEERING) (SEMESTER - II)

COURSE NAME: ENGINEERING MATHEMATICS III

COURSE CODE: CSUA22171/ITUA22171

(PATTERN 2017)

Time: [**2 Hours**]

[Max. Marks: 50]

(*) Instructions to candidates:

1) **Answer Q.1, Q.2, Q.3, Q.4, Q.5 OR Q.6, Q.7 OR Q.8**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data wherever required**

Q.1) a) Using method of variations of parameters solve $\frac{d^2y}{dx^2}+3\frac{dy}{dx}+2y=e^{e^x}$ [6]

OR

b) The currents x and y in the coupled circuits are given by

$$L\frac{dx}{dt}+Rx+R(x-y)=E$$

$$L\frac{dy}{dt}+Ry-R(x-y)=0$$

Find x and y in terms of t. [6]

Q.2) a) Using Z Transform obtain f(k) ,given that 12f(k+2)-7f(k+1)+f(k)=0, $k\geq 0$ and f(0)=0,f(1)=3 . [6]

OR

b) Using Fourier sine integral representation ,show that ;

$$\int_0^\infty \frac{\sin\pi\lambda\sin\lambda x}{1-\lambda^2}d\lambda=\begin{cases}\frac{\pi}{2}\sin x, & 0\leq x\leq\pi\\ 0, & x\geq\pi\end{cases}$$ [6]

Q.3) a) The first four moments about the working mean 30.2 of a distribution are 0.255, 6.222, 30.211 and 400.25.Calculate the first four moments about the mean. Also find mean, Standard Deviation, Coefficients of Skewness and Kurtosis of the distribution. [6]

OR

b) Obtain regression lines for the following data; [6]

x	6	2	10	4	8
y	9	11	5	8	7

Q.4) a) *Solve the following equations by Gauss Seidal method:*

2x+y+6z=9;

8x+3y+2z=13 ; [4]

x+5y+z=7 perform three iterations.

OR

b) *Apply Runge – Kutta* Fourth order method to find an approximate value of y when x=0.1, given that $\frac{dy}{dx}$=x+y and y=1 when x=0, by taking h=0.1. [4]

Q.5) a) Show that vector field $\overline{F}=(6xy+z^3)\overline{i}+(3x^2-z)\overline{j}+(3xz^2-y)\overline{k}$ is irrotational. Hence find corresponding scalar field ϕ such that $\overline{F} = \nabla\phi$. [6]

b) Find the directional derivative of the function $\phi = e^{2x-y-z}$ at (1,1,1) in the direction of the tangent to the curve $x = e^{-t}$, $y = 2\sin t + 1$, $z = t - \cos t$ at t=0. [4]

c) Evaluate $\int_C \overline{F}\cdot d\overline{r}$ for $\overline{F} = \left(2xy + 3z^2\right)\overline{i} + (x^2 + 4yz)\overline{j} + \left(2y^2 + 6xz\right)\overline{k}$ along the path $x = t, y = t^2, z = t^3$ joining the points (0, 0, 0) and (1, 1, 1). [4]

OR

Q.6) a) If the vector field $\overline{F} = (x + 2y + az)\overline{i} + (bx - 3y - z)\overline{j} + (4x + cy + 2z)\overline{k}$ is conservative, then find values of a, b, c and hence determine scalar field ϕ such that $\overline{F} = \nabla\phi$. [6]

b) Show that $\nabla^2\left[\nabla\cdot\left(\frac{\overline{r}}{r^2}\right)\right] = \frac{2}{r^4}$ [4]

c) A vector field is given by $\overline{F} = \sin y\overline{i} + x(1 + \cos y)\overline{j}$, evaluate using Green's theorem, $\int_C \overline{F}\cdot d\overline{r}$,where C is the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1, z = 0$. [4]

Q.7) a) Show that the function $v = 3x^2y - y^3$ is harmonic, Find harmonic conjugate 'u' of v such that f(z)=u +iv is analytic function, hence determine analytic function f(z) in terms of z. [6]

b) Evaluate $\oint_C \frac{4z^2 + z}{z^2 - 1}dz$, where 'C' is the contour $|z - 1| = \frac{1}{2}$ [4]

c) Find the Bilinear transformation which maps the points –i , 0 , 2+i of the Z- plane on to the points 0, -2i , 4 of the W- plane. [4]

OR

Q.8) a) Apply Residue Theorem to evaluate $\oint_C \frac{z^3 - 5}{(z+1)^2(z-2)}dz$, where 'C' is the circle |z|=3. [6]

b) If f(z) is analytic function , show that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$ [4]

c) Show that, under the transformation $w = \frac{i - z}{i + z}$, X-axis in Z-plane is mapped onto the circle |w|=1. [4]

##END##