Total No. of Questions – [08]   Total No. of Printed Pages:02

G.R. No.

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) Solve $x^2 \dfrac{d^2 y}{dx^2} + x \dfrac{dy}{dx} + y = \sin(\log x^2)$ [6]

OR

b) Using method of variations of parameters Solve $(D^2 + 1)y = \tan x$ [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 ;

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

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

[6]

Q.4) a) *Solve the following equations by Gauss Seidal method:*
2x+y+6z=9;
8x+3y+2z=13 ;
x+5y+z=7 perform two iterations.   [4]

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+ xy 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 $\int\limits_C \overline{F} \cdot d\overline{r}$ for $\overline{F} = (2xy + 3z^2)\overline{i} + (x^2 + 4yz)\overline{j} + (2y^2 + 6xz)\overline{k}$ 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 $\nabla^2\left[\nabla \cdot \left(\dfrac{\overline{r}}{r^2}\right)\right] = \dfrac{2}{r^4}$ [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, $\int\limits_C \overline{F} \cdot d\overline{r}$, where C is the ellipse $\dfrac{x^2}{25} + \dfrac{y^2}{16} = 1, z = 0$. [4]

Q.7) a) Show that the function $v = 3x^2 y - y^3$ 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 $\oint\limits_C \dfrac{4z^2 + z}{z^2 - 1}dz$, where 'C' is the contour $|z - 1| = \dfrac{1}{2}$ [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) Find an analytic function f(z) = u + iv if
$$u + v = e^x(\cos y - \sin y)$$ [6]

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

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

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