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

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Paper Code - U219-131 (BE-F4F8)

DECEMBER 2019/ END-SEM Backlog Exam

S. Y. B. TECH. (E&TC ENGINEERING) (SEMESTER - I)

COURSE NAME: ENGINEERING MATHEMATICS III

COURSE CODE: ETUA21171

(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 $x^2\dfrac{d^2y}{dx^2}+x\dfrac{dy}{dx}+y=\sin(\log x^2)$ [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) Show that $\bar{F}=ye^{xy}\cos z\,\bar{i}+xe^{xy}\cos z\,\bar{j}-e^{xy}\sin z\,\bar{k}$ is irrotational. Find scalar ϕ such that $\bar{F}=\nabla\phi$ [4]

OR

b) Find the directional derivative of the function $\phi=x^2-y^2+2z^2$ at the point $(2,-1,3)$ along the directionnormal to the surface $x^2+y^2+z^2=9$ at $(1,2,2)$. [4]

Q.5) a) Evaluate $\iint_S (x^3\bar{\imath}+y^3\bar{\jmath}+z^3\bar{k}).d\bar{S}$ where S is surface of the sphere $x^2+y^2+z^2=16$. [6]

b) Using Green's Theorem evaluate the integral $\int_C \bar{F}.d\bar{r}$ for:

$$\bar{F} = \cos y\,\hat{\imath} + x(1-\sin y)\,\hat{\jmath} \text{ where C is the circle } x^2+y^2=1, z=0.$$ [4]

c) Evaluate $\int_C \bar{F}\cdot d\bar{r}$ for $\bar{F} = (2xy+3z^2)\bar{i} + (x^2+4yz)\bar{j} + (2y^2+6xz)\bar{k}$ 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) Verify Stoke's theorem $\bar{F} = xy^2\hat{\imath} + y\hat{\jmath} + z^2x\hat{k}$ for the surface of rectangular lamina bounded by $x=0, x=1, y=0, y=2, z=0$. [6]

b) Show that $\iint_S \left(\frac{\bar{r}}{r^3}\right).\hat{n}\, dS = 0$ [4]

c) A vector field is given by $\bar{F} = \sin y\bar{i} + x(1+\cos y)\bar{j}$, evaluate using Green's theorem, $\int_C \bar{F}\cdot d\bar{r}$,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) 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 $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f^1(z)|^2$ [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]

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