Total No. of Questions – [8] Total No. of Printed Pages 2

G.R. No.	

U218-131 (ESE)

DECEMBER 2018/ENDSEM

S. Y. B. TECH. (E&TC) (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 where ever required**

Q.1)a)Solve by variation of parameter method $(D^2+4)y=\tan 2x$ [6 marks]

OR

b) $x^2\dfrac{d^2y}{dx^2}-3x\dfrac{dy}{dx}+5y=x^2\log x$ [6 marks]

Q.2) a) Find the Fourier cosine integral representation for the function

$$f(x)=\begin{cases} x^2, & 0<x<a \\ 0, & x>a \end{cases}$$ [6 marks]

OR

b) Solve 6 f (k + 2) - 5 f (k + 1) + f (k) = 0, k ≥ 0, f (0) = 0, f (1) = 3

[6 marks]

Q.3) a) Calculate the 1st four moments of following distribution about the mean and hence find β_1, β_2. [6 marks]

x	2.0	2.5	3.0	3.5	4.0	4.5	5.0
f	4	36	60	90	70	40	10

OR

b) Find the regression line of y on x for [6 marks]

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

Q.4) a) Show that $\bar{F} = (y^2 cosx + z^2)\bar{\imath} + (2ysinx)\bar{\jmath} + (2xz)\bar{k}$ is irrotational and find the scalar $\emptyset$ such that $\bar{F} = \nabla\emptyset$. [4 marks]

OR

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

Q. 5) a) Using Green's Theorem evaluate the integral $\int_C \bar{F}.d\bar{r}$ for $\bar{F} = \sin y\,\hat{\imath} + x(1 + \cos y)\,\hat{\jmath}$ where C is the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, z = 0$. [6marks]

b) Find the work done in moving a particle once round the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1, z = 0$ under the force field given by $\bar{F} = (2x - y + z)\hat{\imath} + (x + y - z^2)\hat{\jmath} + (3x - 2y + 4z)\hat{k}$. [4 marks]

c) Show that $\iiint_V \frac{dV}{r^2} = \iint_S \left(\frac{\bar{r}}{r^2}\right).\hat{n}\, dS$ [4 marks]

OR

Q.6) 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 marks]

b) Evaluate $\int_C \bar{F}.d\bar{r}$ for $\bar{F} = (2x + y^2)\hat{\imath} + (3y - 4x)\hat{\jmath}$ along the parabolic arc $y = x^2$ joining(0,0) and (1,1). [4 marks]

c) Using Stoke's Theorem evaluate following surface integrals:
$\iint_S (\nabla \times \bar{F}).d\bar{S}$ where $\bar{F} = (x^3 - y^3)\hat{\imath} - xyz\hat{\jmath} + y^3\,\bar{k}$ and S is the surface $x^2 + 4y^2 + z^2 - 2x = 4$, above the plane $x = 0$. [4 marks]

Q.7) a) Evaluate following integrals using Cauchy-Residue Theorem

$\oint_c \frac{2z^2 + 2z + 1}{(z+1)^2(z-3)} dz$ where $c : |z + 1| = 2$. [6 marks]

b)Find an analytic function $f(z) = u + iv$ if $u - v = (x - y)(x^2 + 4xy + y^2)$ [4marks]

c) Find the bilinear transformation which maps the points $0, 1, \infty$ of the z –plane on to the points $i, -1, -i$ of the w – plane. [4 marks]

OR

Q.8) a) If $f(z) = u + iv$ is an analytic function, then prove that:
$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$. [6marks]

b) Evaluate following integrals using Cauchy-Integral formula

$\oint_C \frac{e^z}{(z+2)} dz$ where C is the circle $|z + 2| = 2$ [4 marks]

c) Find a function v such that $f(z) = u + iv$ is analytic and express $f(z)$ in terms of z.

where $u = 3x^2 - 3y^2 + 2y$ [4 marks]