Total No. of Questions – [06] Total No. of Printed Pages: 02

| G.R. No. | |
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paper code : U239-111 (ESE)

**DECEMBER 2019 ENDSEM**

**S. Y. B.TECH. (CIVIL ENGINEERING) (SEMESTER – III)**

**COURSE NAME: ENGINEERING MATHEMATICS III**

**COURSE CODE: ES21181CV**

**(PATTERN 2018)**

Time: [2 Hours] [Max. Marks: 50]

(*) Instructions to candidates:

1) All questions are compulsory.

2) Figures to the right indicate full marks.

3) Use of scientific calculator is allowed.

4) Assume suitable data where ever required.

Q.1 Attempt any **one**

a) Solve the following differential equation $x^2\frac{d^2y}{dx^2}-4x\frac{dy}{dx}+6y=x^5$ [4]

b) Solve the following differential equation $\frac{d^3y}{dx^3}+8y=x^4+2x+1$ [4]

Q.2 Attempt any **one**

a) Apply Runge-Kutta Fourth order method to find an approximate value of y when x=0.2, Given that $\frac{dy}{dx}=\frac{y^2-x^2}{y^2+x^2}$ and y=1 when x=0. [4]

b) Solve the following by Euler's modified method; $\frac{dy}{dx}=\log(x+y)$, y(1)=2 at x=1.2 and 1.4 with h=0.2 [4]

Q.3 Attempt any **one**

a) The regression equation equations are 8x-10y+66=0 and 40x-18y=214. The value of variance of x is 9. Find; 1)The mean values of x and y. 2) The correlation coefficient between x and y. 3) The Standard Deviation of y. [6]

b) The first four moments of a distribution about the value 30.2 are 0.255, 6.222, 30.211 and 400.25 .Find the first four central moments. Also find mean, standard deviation, and comment on skewness and kurtosis. [6]

Q.4 Attempt any **one**

a) i) Average number of phone calls per minute coming into company is 3, during certain period. Using Poisson distribution find probability that during one particular minute there will be less than two calls.

ii)In a normally distributed group of 450 students with mean 42 and standard deviation 8, find the number of students scoring less than 48 marks
( Given Area corresponding to z = 0.75 is 0.2734) [6+4]

b) i)A manufacturer of cotter pins knows that 3% of his product is defective. If he sells cotter pins in boxes of 100 pins and guarantees that not more than 6 pins will be defective in a box. Find the approximate probability that a box will fail to meet the guaranteed quality.

ii)Fit a Poisson distribution to the following data

| x | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| f | 142 | 158 | 67 | 27 | 5 | 1 |

[4+6]

Q.5 Attempt any **one**

a) i)Show that $u=4xy-3x+2$ is harmonic, hence find harmonic conjugate 'v' of u and hence determine analytic function f(z)=u +i v in terms of z. &
Find the Bilinear transformation which maps the points 1 , i, -1 of the Z- plane on to the points i , 0, -i of the W- plane.

ii) Evaluate $\oint_C \frac{2z^2+z+5}{\left(z-\frac{3}{2}\right)^2}dz$ , where 'C' is the ellipse $\frac{x^2}{4}+\frac{y^2}{9}=1$ [7+6]

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

Find the Bilinear transformation which maps the points $0, -i, 2i$ of the Z- plane on to the points $5i, \infty, \frac{-i}{3}$ of the W- plane.

ii)Apply Residue Theorem to evaluate $\int_C \frac{z^2+1}{z^2-1}dz$ where 'c' is the circle |z|=2 [7+6]

Q.6 Attempt any **one**

a) i)A string is stretched and fastened to two points $l$ apart. Motion is started by displacing the string in the form u=a $\sin\left(\frac{\pi x}{l}\right)$ from which is released at time t=0, find the displacement from one end.

ii)Solve $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$ for the conduction of heat along a rod without radiation if

(i) u is finite as $t\to\infty$ (ii) $\frac{\partial u}{\partial x}=0$ when x = 0 and x = $l$ (iii)u(x,0)= $lx-x^2$, $0\le x\le l$ [6+7]

b) i)If $\frac{\partial^2 y}{\partial t^2}=c^2\frac{\partial^2 y}{\partial x^2}$ represents the vibrations of a string of length ' $l$ ' fixed at both ends, find the solution with boundary conditions, (1)y(0,t)=0 (2)$y(l,t)=0$

(3) $\left(\frac{\partial y}{\partial t}\right)_{t=0}=0$ (4) y(x,0)= k$\left(lx-x^2\right)$, $0\le x\le l$

ii) Find the temperature at any time if homogeneous rod of conducting material of length 100cm has its ends kept at zero temperature and the temperature initially is

$$u(x,0)=\begin{cases} x & 0\le x\le 50 \\ 100-x & 50\le x\le 100 \end{cases}$$

[7+6]