=Total No. of Questions – [8] Total No. of Printed Pages 02

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S. Y. B. TECH. (CIVIL ENGINEERING) (SEMESTER - I)

COURSE NAME:ENGINEERING MATHEMATICS III

COURSE CODE: CVUA21171

(PATTERN 2017)

Time: [**2Hours**] [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 $x^3\frac{d^3y}{dx^3}+2x^2\frac{d^2y}{dx^2}+2y=x$ [6]

OR

b) Solve by method of variation of parameter $\frac{d^2y}{dx^2}+3\frac{dy}{dx}+2y=\sin e^x$ [6]

Q.2) a) Solve the following equations by Gauss Seidal method

2x+y+6z=9;

8x+3y+2z=13 ;

x+5y+z=7

[6]

OR

b) Solve the integral equation ;

$\int_0^\infty f(x)\cos\lambda x\,dx=\begin{cases}1-\lambda & 0\le\lambda\le1\\ 0 & \lambda\ge1\end{cases}$ & hence show that $\int_0^\infty \frac{\sin^2 t}{t^2}dt=\frac{\pi}{2}$ [6]

Q.3) a) Thefirst four moments of a distribution about the value 24 are 1.33, 129.08, 450.46 and 37693.83 .Find the first four central moments. Also find mean, standard deviation, and comment on skewness and kurtosis. [6]

OR

b) 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]

Q.4) a) Show that the vector field $\bar{F}=(6xy+z^3)\bar{i}+(3x^2-z)\bar{j}+(3xz^2-y)\bar{k}$ is conservative and find scalar field ϕ such that $\bar{F}=\nabla\phi$ [4]

OR

b) Find the directional derivative of the function $\phi=xy^2+yz^3$ at (2,-1,1) along the line 2(x-2)=(y+1)=(z-1) [4]

Q.5) a) Using Gauss Divergence Theorem Evaluate $\iint_S(x^3\bar{i}+y^3\bar{j}+z^3\bar{k}).\bar{ds}$ over the [6] surface of the of the sphere $x^2+y^2+z^2=16$.

b) Evaluate $\int_C \bar{F}.d\bar{r}$ for $\bar{F}=(2x+3)\bar{i}+xz\,\bar{j}+(yz-x)\bar{k}$ along the straight line joining (0, 0,0) and (3,1,1). [4]

c) Using Green's theorem evaluate $\int_C \bar{F}\cdot d\bar{r}$ where $\bar{F}=x^2\bar{i}+xy\bar{j}$ over the curve $y=x^2$, and then $y=x$ [4]

OR

Q.6) a) Show that $\iint_s \frac{\bar{r}.\hat{n}}{r^2}ds=\iiint_v \frac{dv}{r^2}$ [6]

b) Using Green's theorem evaluate $\int_c \bar{F}.d\bar{r}$ for $\bar{F}=\sin y\bar{i}+x(1+\cos y)\bar{j}$ where c is the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ [4]

c) Evaluate $\int_C \bar{F}\cdot d\bar{r}$, for $\bar{F}=(2x+y)\bar{i}+(3y-x)\bar{j}$ where 'C' is the straight line joining (0,0) and (3,2) [4]

Q.7) a) Solve $\frac{\partial V}{\partial t}=k\frac{\partial^2 V}{\partial x^2}$ if (i) $V\neq\infty$ as $t\to\infty$ (ii) $\left(\frac{\partial V}{\partial x}\right)_{x=0}=0,\forall t$ (iii) $V(l,t)=0,\forall t$ (iv) $V(x,0)=v_0$ for $0\le x\le l$ [6]

b) 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 .Write the differential equation for given problem and write conditions in mathematical form. [4]

c) In above question 7) b). Find the displacement from one end [4]

OR

Q.8) a) A homogeneous rod of conducting material of length 100cm has its ends kept at zero temperature and the temperature initially is

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

Find the tempereture u(x,t) at any time . [6]

b) A rectangular plate with insulated surface is 10cm wide and so long to its width that it may considered infinite in length without introducing an appreciable error .If the temperature of the short edge y=0 is given by $u(x,0)=100\sin\frac{\pi x}{10}$ $0\le x\le 10$,and two long edges x=0,x=10 as well as the other short edge are kept at 0^0C .write conditions in mathematical form. [4]

c) In above question 8) b) Find the steady-state temperature u(x,y). [4]

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