Total No. of Questions – [8] Total No. of Printed Pages :03

G.R. No.	

U218-111(ESE)

DECEMBER 2018/ENDSEM

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

COURSE NAME: Engineering Mathematics III

COURSE CODE:CVUA21171

(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 whereever required**

Q.1) a) Using method of variations of parameters solve $(D^2+3D+2)y=\sin e^x$ [6 marks]

OR

b)Solve $(2x+1)^2\frac{d^2y}{dx^2}-6(2x+1)\frac{dy}{dx}+16y=8(2x+1)^2$ [6 marks]

Q.2) a) Apply Gauss Seidal iteration method to solve the equations

$20x + y - 2z = 17$

$3x + 20y - z = -18$

$2x - 3y + 20z = 25$ [6 marks]

OR

b) Find the Fourier cosine representation for the function $f(x)=\begin{cases}x^2, & 0<x<a\\ 0, & x>a\end{cases}$ [6 marks]

Q.3) a) The average number of misprints per page of a book are 1.5.Assuming the Poisson distribution, find

(i) The particular book is free from misprints.

(ii) Number of pages containing more than one misprint if the book contains 900 pages. [6 marks]

OR

b) Obtain regression lines for the following data

x	2	3	5	7	9	10	12	15
y	2	5	8	10	12	14	15	16

[6 marks]

Q.4) a) Find the directional derivative of $\phi = 4xz^3 - 3x^2y^2z$ at (2,-1,2) along a line equally inclined with co-ordinate axes. [4 marks]

OR

b) Show that $\nabla^4(r^2 \log r) = \frac{6}{r^2}$ [4 marks]

Q. 5) a) Using Gauss Divergence Theorem Show that $\iint_S \frac{\bar{r}}{r^2} . d\bar{s} = \iiint_V \frac{dv}{r^2}$ [6 marks]

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

c) A vector field is given by $\bar{F} = \sin y \bar{i} + x(1 + \cos y)\bar{j}$ Using Green's theorem evaluate $\int_c \bar{F}.d\bar{r}$ where c is the boundary of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, z = 0$ [4 marks]

OR

Q.6) a) Apply Stoke's Theorem to calculate $\int_c 4ydx + 2zdy + 6ydz$,where c is the curve Of intersection of $x^2 + y^2 + z^2 = 6z$ and $x - z + 3 = 0$ [6 marks]

b) If $\bar{F} = (2x + y^2)\bar{i} + (3y - 4x)\bar{j}$ then evaluate $\int_c \bar{F}.d\bar{r}$ around the parabolic arc $y = x^2$ Joining (0,0) and (1,1). [4 marks]

c) Show that $\iint_s \frac{\bar{r}}{r^3} . d\bar{s} = 0$ [4 marks]

Q.7) a) Solve $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ if (i) u is finite for all t , (ii) u(0,t)=0 for all t ,(iii) u(l,t)=0 for all t. (iv) (iv) u(x,0)= u_0 for $0 \le x \le l$ where l being length of the bar. [6 marks]

b) A string is stretched and fastened to two points l apart. Motion is started by displacing the string in the form u=asin$\left(\frac{\pi x}{l}\right)$ from which is released at time t=0. State the conditions in mathematical form [4 marks]

c) Find the displacement from one end of above problem in question 7 b) (use wave equation $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$) [4 Marks]

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 marks]

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 . State the conditions in mathematical form. [4 marks]

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

####End####