Total No. of Questions : 9]

SEAT No. :

P9110

[Total No. of Pages : 5

[6179]-235

S.E. (Computer/IT)/(Computer Science & Design Engg.)/(AI & ML)
ENGINEERING MATHEMATICS-III
(2019 Pattern) (Semester-IV) (207003)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Question 1 is compulsory.*
2) *Attempt Q.2 or Q.3, Q.4 or Q.5, Q.6 or Q.7, Q.8 or Q9.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of electronic pocket calculator is allowed.*
6) *Assume suitable data if necessary.*

Q1) Write the correct option for the following multiple choice questions.

a) For a given set of bivariate data, $\bar{x} = 2, \bar{y} = -3$. The regression coefficient of y on x is -4. Using the regression equation of y on x, the most probable value of y when $x = 1$ is ______. **[2]**

i) -1 ii) 1

iii) -2 iv) 2

b) If probability density function $f(x)$ of a continuous random variable x is

$f(x) = \frac{x}{8}$ for $0 \leq x \leq 4$, then $p(x \leq 3) =$ _____. **[2]**

i) 0 ii) $\frac{3}{4}$

iii) $\frac{9}{16}$ iv) 1

c) Lagrange's polynomial through the points **[2]**

x	0	1	2
y	4	5	12

is given by ______.

i) $y = 4x^2 - 3x + 4$ ii) $y = x^2 + 4$

iii) $y = 2x^2 - x + 4$ iv) $y = 3x^2 - 2x + 4$

P.T.O.

d) Using Gauss elimination method, the solution of system of equations $x+\frac{1}{4}y+\frac{1}{4}z=1, \frac{15}{4}y-\frac{9}{4}z=3, \frac{5}{4}y-\frac{19}{4}z=3$ is ______. **[2]**

i) $x=1, y=\frac{1}{2}, z=\frac{-1}{2}$
ii) $x=\frac{1}{2}, y=1, z=\frac{1}{2}$
iii) $x=2, y=\frac{1}{2}, z=2$
iv) $x=1, y=2, z=3$

e) The first four central moments of a distribution are 0, 0.453, 0.06 and 0.502. The coefficient of Kurtosis β_2 is ______. **[1]**

i) 0.0387
ii) 2.4463
iii) 25.8221
iv) 0.4088

f) If $f(x)$ is a continuous function on $[a,b]$and $f(a)\,f(b) < 0$, then to find a root of $f(x) = 0$, initial approximation x_0 by bisection method is ______. **[1]**

i) $x_0=\frac{a-b}{2}$
ii) $x_0=\frac{f(a)+f(b)}{2}$
iii) $x_0=\frac{a+b}{2}$
iv) $x_0=\frac{a-b}{a+b}$

Q2) a) The first four moments of a distribution about the value 5 are 2, 20, 40 and 50. Obtain the first four central moments, β_1 and β_2. **[5]**

b) Fit a straight line of the form $y = a + bx$ to the following data by the least square method. **[5]**

x	–2	1	3	6	8	9
y	17	14	12	9	7	6

c) For a bivariate data, the regression equation of y on x is $8x–10y = –66$ and the regression equation of x on y is $40x – 18y = 214$. Find the mean values of x and y. Also, find the correlation coefficient between x and y. **[5]**

OR

Q3) a) Following are the runs scored by two batsmen in 5 cricket matches. Which batsman is more consistent in scoring runs? **[5]**

Score by (x) Batsman A	38	47	34	18	33
Score by (y) Batsman B	37	35	41	27	35

b) Fit a parabola of the form $y = a + bx + cx^2$. Using the least square method to the following data. **[5]**

x	–2	–1	0	1	2
y	–2	5	8	7	2

c) Find the correlation coefficient between age in years (x) and glucose level (y) from the data of 5 people as follows. **[5]**

x	43	22	25	42	58
y	99	65	79	75	87

Q4) a) A fair die is tossed once. Random variable x denote the digit that appears as top face. Find the expectation E(x). **[5]**

b) The number of breakdowns of a computer in a week is a poisson variable with $\lambda = np = 0.3$. What is the probability that the computer will operate. **[5]**

i) With no breakdown

ii) At most one breakdown in a week.

c) In a certain city 4000 lamps are installed. If the lamps have average life of 1500 burning hours. Assuming normal distribution. **[5]**

i) How many lamps will fail in first 1400 hours?

ii) How many lamps will last beyond 1600 hours?

[Given : $z = 1$, A = 0.3413]

OR

Q5) a) Two cards are drawn from a well shuffled pack of 52 cards. Find the probability that they are both kings if **[5]**

i) The first card drawn is replaced

ii) The first card drawn is not replaced

b) A certain factory turning cotter pins knows that 2% of its product is defective. If it sells cotter pins and gurantees that not more than 5 pins will be defective in a box of 100 pins. Find the approximate probability that a box will fail to meet the guranteed quality. **[5]**

c) A bank utilizes four windows to render fast service to the customers on a particular day 800 customers were observed. They were given service at the different windows as follows: **[5]**

Window Number	Number of Customers
1	150
2	250
3	170
4	230

Test whether the customers are uniformly distributed over the windows.

[Given : $\chi^2_{3,0.05} = 7.815$] [Use 5% level of significance]

Q6) a) Find the root of the equation $x^3 - 4x + 1 = 0$ lying in the interval $\left(0, \frac{1}{2}\right)$ by Bisection method correct upto 3 decimal places (Five iterations only) **[5]**

b) Find the root of the equation $x^2 - 12 = 0$ lying between (3, 4) by Newton-Raphson method correct upto 3 decimal places. **[5]**

c) Solve by Gauss-Seidel method the system of equations. **[5]**

$5x - y = 9$

$-x + 5y - z = 4$

$-y + 5z = -6$

Take initial solution as $\left(\frac{9}{5}, \frac{4}{5}, \frac{6}{5}\right)$ write numerical calculations correct upto three decimal places.

OR

Q7) a) Solve by Gauss elimination method, **[5]**

$2x + y + z = 10$

$3x + 2y + 3z = 18$

$x + 4y + 9z = 16$

b) Solve by Jacobi's iteration method, **[5]**

$20x_1 + x_2 - 2x_3 = 17$

$3x_1 + 20x_2 - x_3 = -18$

$2x_1 - 3x_2 + 20x_3 = 25$

Write numerical calculations correct upto 3 decimal places.

c) Use Regula-Falsi method to find real root of the equation $e^x - 4x = 0$ lying between $\left(0, \frac{1}{2}\right)$, correct to three decimal places. **[5]**

Q8) a) Using Newton's forward interpolation formula, find the population in the year 1895 from given data, **[5]**

x (year)	1891	1901	1911	1921	1931
y (pop^n)	46	66	81	93	101

b) Evaluate, $\int_0^1 e^x\,dx$ using Simpson's 1/3[rd] rule (h = 0.2). **[5]**

c) Use Euler's method to solve $\frac{dy}{dx} = x^2 + y$, $y(0) = 1$, h = 0.1 Tabulate values of y for x = 0.1 to x = 0.4. **[5]**

OR

Q9) a) Use Runge-Kutta method of 4[th] order to solve $\frac{dy}{dx} = y - x$, y (0) = 1 at x = 0.2 with h = 0.2. **[5]**

b) Using modified Euler's method find y(0.1), given $\frac{dy}{dx} = 1 + xy$, $y(0) = 1$, h = 0.1 (Two iterations only). **[5]**

c) Using Newton's backward difference formula, find y at x = 3.5 from following data, **[5]**

x	0	1	2	3	4	5
y	5.2	8	10.4	12.4	14	15.2

❖ ❖ ❖