Total No. of Questions : 9]

SEAT No. :

P657

[Total No. of Pages : 6

[5869] - 286

S.E. (Computer/Information Technology)

ENGINEERING MATHEMATICS - III

(2019 Pattern) (Semester - IV)

Time : 2 ½Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Q.1 is compulsory.*
2) *Attempt Q2, or Q.3, Q4 or Q5, Q6 or Q7, Q8 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 x on y is –0.11. By using the regression equation of x on y , the most probable value of x when y=0 is ______. **[2]**

i) 0.57 ii) 0.87

iii) 0.77 iv) 1.77

b) If Probability density function $f(x)$ of a continuous random variable x is defined by

$$f(x)=\begin{cases}\frac{1}{4}, -2 \le x \le 2\\ 0, \text{otherwise}\end{cases}$$

then $P(x \le 1)$ is ______. **[2]**

i) $\frac{1}{4}$ ii) $\frac{1}{2}$

iii) $\frac{1}{3}$ iv) $\frac{3}{4}$

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c) Lagrange's polynomial through the points

x	0	1	2
y	4	0	6

is given by ________. **[2]**

i) $y = 5x^2-3x+4$

ii) $y = 5x^3+3x+4$

iii) $y = 5x^2-9x+4$

iv) $y = x^2-9x+4$

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) $x=1, y=2, z=3$

ii) $x=\frac{1}{2}, y=1, z=\frac{1}{2}$

iii) $x=2, y=\frac{1}{2}, z=2$

iv) $x=1, y=\frac{1}{2}, z=-\frac{1}{2}$

e) The first four central moments of a distribution are 0,16,–64 and 162. The coefficient of Kurtosis β_2 is ______. **[1]**

i) 1.20

ii) 0.6328

iii) 1

iv) 0.3286

f) If $f(x)$ is continuous 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) If marks scored by five students in statistics test of 100 marks, are given in following table. **[5]**

Student	1	2	3	4	5
Marks(/100)x	46	34	52	78	65

Find standard deviation and arithmetic mean $\overline{x}$.

b) Fit a law of the form $y=ap+b$ by least square method for the data, **[5]**

p	100	120	140	160	180	200
y	0.9	1.1	1.2	1.4	1.6	1.7

c) If the two lines of regression are $9x+y-\lambda=0$ and $4x+y=\mu$ and the means of x & y are 2 & –3 respectively. Find values of λ,μ and correlation coefficient between x & y. **[5]**

OR

Q3) a) The first four moments of a distribution about 5 are 2,20,40 and 50. Find first four moments about mean, and β_1,β_2. **[5]**

b) Fit a parabola $y=ax^2 + bx + c$, by using least square method to the following data, **[5]**

x	0	1	2	3
y	2	2	4	8

c) Calculate the coefficient of correlation from the following information,

$n=10$, $\Sigma x=40$, $\Sigma x^2=190$, $\Sigma y^2=200$, $\Sigma xy=150$, $\Sigma y=40$. **[5]**

Q4) a) Bag 1 contains 2 white and 3 red balls. Bag 2 contains 4 white and 5 red balls. One ball is drawn randomly from bag 1 and is placed in bag2. Later, one ball is drawn randomly from bag2. Find the probability that it is red. **[5]**

b) The expected number of matches those will be won by India in a series of five one day matches between India and England is three. If the probability of India's win in each match remains the same and the results of all the five matches are independent of each other, find the probability that India wins the series, using Binomial distribution. Assume that each match ends with a result. **[5]**

c) The lifetime of an article has a normal distribution with mean 400 hours and standard deviation 50 hours. Find the expected number of articles out of 2,000 whose lifetime lies between 335 hours to 465 hours. (Given : Z=1.3,A=0.4032) **[5]**

OR

Q5) a) Find the expected value of the number of heads obtained when three fair coins are tossed simultaneously. **[5]**

b) On an average, 180 cars per hour pass a specified point on a particular road. Using Poisson distribution, find the probability that at least two cars pass the point in any one minute. **[5]**

c) The proportions of blood types O,A,B and AB in the general population of a country are known to be in the ratio 49:38:9:4 respectively. A research team observed the frequencies of the blood types as 88,80,22 and 10 respectively in a community of that country. Test the hypothesis at 5% level of significance that the proportions for this community are in accordance with the general population of that country. (Given : $\chi^2_{tab}=7.815$) **[5]**

Q6) a) Find the root of the equation $x^4+2x^3-x-1=0$, lying in the interval [0,1] using the bisection method at the end of fifth iteration. **[5]**

b) Find a real root of the equation $x^3+2x-5=0$ by applying Newton-Raphson method at the end of fifth iteration. **[5]**

c) Solve by Gauss-Seidel method, the system of equations:

$$20x_1 + x_2 - 2x_3 = 17$$

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

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

[5]

OR

Q7) a) Solve by Gauss elimination method, the system of equations:

$$2x_1 + x_2 + x_3 = 10$$

$$3x_1 + 2x_2 + 3x_3 = 18$$

$$x_1 + 4x_2 + 9x_3 = 16$$ **[5]**

b) Solve by Jacobi's iteration method, the system of equations:

$$4x_1 + 2x_2 + x_3 = 14$$

$$x_1 + 5x_2 - x_3 = 10$$

$$x_1 + x_2 + 8x_3 = 20$$ **[5]**

c) Use Regula-Falsi method to find a real root of the equation $e^x - 4x = 0$ correct to three decimal places. **[5]**

Q8) a) Using Newton's forward interpolation formula, find y at $x=8$ from the following data.

x	0	5	10	15	20	25
y	7	11	14	18	24	32

[5]

b) Evaluate $\int_0^1 \frac{dx}{x^2+1}$

using Simpson's $\frac{1}{3}^{rd}$ rule. (Take $h=0.2$) **[5]**

c) Use Euler's method, to solve $\frac{dy}{dx} = x + y,\ y(0) = 1$

Tabulate values of y for $x=0$ to $x=0.3$ (Take $h=0.1$) **[5]**

OR

Q9) a) Use Runge-Kutta method of 4^{th} order, to solve

$$\frac{dy}{dx} = xy,\ y(1) = 2 \text{ at } x=1.2 \text{ with } h=0.2.$$ **[5]**

b) Using Modified Euler's method, find y(0.2),

given $\frac{dy}{dx} + xy^2 = 0,\ y(0) = 2$ Take h=0.2 (Two iterations only) **[5]**

c) Using Newton's backward difference formula, find the value of $\sqrt{155}$ from the following data

x	150	152	154	156
$y = \sqrt{x}$	12.247	12.329	12.410	12.490

[5]