Total No. of Questions : 9]

SEAT No. :

PB3630

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[Total No. of Pages : 5

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

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Attempt Q.2 or Q.3, Q.4 or Q.5, Q.6 or Q.7, Q.8 or Q.9.***
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) The first three moments of a distribution about the value 5 are 2,20 and 40. Third moment about the mean is **[2]**

i) – 64 ii) 64

iii) 32 iv) – 32

b) If probability density function $f(x)$ of a continuous random variable x is defined by $f(x) = \begin{cases} \frac{1}{4}, -2 \le x \le 2 \\ 0, \text{otherwise} \end{cases}$ **[2]**

then $P(x \le 1)$ is

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

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

c) Using secant method, the first approximation to the root x_2 of the equation $x^3 - 5x - 7 = 0$, if the initial approximations are given as $x_0 = 2.5$ and $x_1 = 3$ is **[2]**

i) 2.7183 ii) 3

iii) 2 iv) 0

P.T.O.

d) If Lagrange's polynomial passes through **[2]**

x	0	1
y	–4	–4

then $\frac{dy}{dx}$ at $x = 1$ is given by

i) 0 ii) 2

iii) 1 iv) $\frac{1}{2}$

e) To compare the variability of two or more than two series, coefficient of variation is obtained using ($\bar{x}$ is arithmetic mean and σ is standard deviation) **[1]**

i) $\frac{\bar{x}}{\sigma} \times 100$ ii) $\frac{\sigma}{\bar{x}} \times 100$

iii) $\sigma \times \bar{x} \times 100$ iv) $\frac{\bar{x}}{\sigma^2} \times 100$

f) If x_0 is initial approximation to the root of the equation $f(x) = 0$ by Newton - Raphson method, first approximation x_1 is given by **[1]**

i) $x_0 = \frac{x_0 + x_1}{2}$ ii) $x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$

iii) $x_1 = x_0 + \frac{f(x_0)}{f'(x_0)}$ iv) $x_1 = x_0 + \frac{f'(x_0)}{f(x_0)}$

Q2) a) Find arithmetic mean and coefficient of variation for x if the data is,

x	1	2	3	4
f	9	6	5	3

[5]

b) Fit a straight line of the form $y = ax + b$ for the data

x	–2	–1	0	1	2
y	5	3	1	–1	–3

[5]

c) Given the information: $\bar{x} = 8.2, \bar{y} = 12.4, \sigma_x = 6.2, \sigma_y = 20\ \gamma(x, y) = 0.9$. Find line of regression of x on y. Estimate x for $y = 10$ **[5]**

OR

Q3) a) The first four moments of a distribution about the value 2 are 2, 10 , 20 and 25. Find first four moments about mean, coefficient of skewness and kurtosis. **[5]**

b) Fit a parabola of the type $y = ax^2 + bx + c$ for the data $\begin{vmatrix} x & -1 & 0 & 1 & 2 \\ y & 3 & 1 & 3 & 9 \end{vmatrix}$ **[5]**

c) Find the coefficient of correlation for following distribution,

$$\begin{vmatrix} x & 5 & 7 & 9 & 11 & 13 \\ y & 9 & 6 & 12 & 3 & 15 \end{vmatrix}$$ **[5]**

Q4) a) A box contains 6 red balls, 4 white balls and 5 blue balls. Three balls are drawn successively from the box. Find the probability that they are drawn in the order red, white and blue if each ball is not replaced. **[5]**

b) A coin is so biased that appearence of head is twice likely as that of tail. If a throw is made 6 times, using Binomial distribution, find the probalility that at least two heads will appear. **[5]**

c) In a distribution, exactly normal, 7% of the items are under 35 and 89% are under 63. Find the mean and standard deviation of the distribution. [Given A(z = 1.48) = 0.43, A(z = 1.23) = 0.39] **[5]**

OR

Q5) a) The average number of misprints per page of a book is 1.5. Assuming the distribution of number of misprints to be poisson, find the number of pages containing more than one misprint if the book contains 900 pages. **[5]**

b) A random sample of 200 screws is drawn from a population which represents the size of screws. If a sample is distributed normally with mean 3.15 cm and standard deviation 0.025cm, find expected number of screws whose size falls between 3.12 cm and 3.2 cm. **[5]**

[Given A(z = 1.2) = 0.3849, A(z = 2) = 0.4772]

c) A nationalised bank utilizes four teller 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	Expected no.of customers
1	150
2	250
3	170
4	230

Test whether the customers are uniformly distributed over the windows at 5% level of significance.

[Given $\chi^2_{3,0.05} = 7.815$]

Q6) a) Using the Bisection method up to fifth iteration, find a real root of the equation $x^3 - 4x - 9 = 0$. **[5]**

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

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

$$45x_1 + 2x_2 + 3x_3 = 58$$

$$-3x_1 + 22x_2 + 2x_3 = 47$$

$$5x_1 + x_2 + 20x_3 = 67$$

OR

Q7) a) Solve the following system by Cholesky's method: **[5]**

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

$$2x_1 + 17x_2 - 5x_3 = -101$$

$$14x_1 - 5x_2 + 83x_3 = 155$$

b) Solve the following system by Gauss elimination method: **[5]**

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

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

$$3x_1 - x_2 + 2x_3 = 1$$

c) Use method of false position to find the fourth root of 32 correct to three decimal places. **[5]**

Q8) a) Using Newton's forward interpolation formula, find the polynomial satisfying the data. **[5]**

x	0	1	2	3	4
y	–4	–4	0	14	44

b) Use simpson's $\frac{1}{3}$ rd rule to obtain $\int_1^2 \frac{1}{x}\,dx$ dividing the interval into four parts. **[5]**

c) Use Euler's method to solve $\frac{dy}{dx} = \frac{x-y}{2}, y(0) = 1$. Tabulate values of y for $x = 0$ to $x = 2$. Take h =0.5. **[5]**

OR

Q9) a) Use Runge - Kutta method of fourth order to solve $\frac{dy}{dx} = x^2 + y^2;\ x_0 = 1,\ y_0 = 1.5$ to find y at $x = 1.1$ taking h = 0.1 **[5]**

b) Using modified Euler's method, find y(0.1) given that $\frac{dy}{dx} = 1 + xy$; y(0) = 1 and h = 0.1. Consider accuracy to four decimal places. **[5]**

c) Using Newton's backward interpolation formula, find the polynomial satisfying the data. Also, find y when $x = 4.5$. **[5]**

x	1	2	3	4	5
y	14	30	62	116	198

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