Total No. of Questions : 9]

SEAT No. :

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[6582]-35

S.E. (Computer Engineering / IT / Computer Science & Design / 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 Q2 or Q3, Q4 or Q5, Q6 or Q7, Q8 or Q9.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicates 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 :

i) Coefficient of correlation between the variables x and y is 0.8 and their covariance is 20, the variance of x is 16. The standard deviation of y is _____. **[2]**

a) 6.75 b) 6.25

c) 7.5 d) 8.25

ii) The mean and variance of binomial probability distribution are $\frac{5}{4}$ and $\frac{15}{16}$ respectively. Probability of success in a single trial p is equal to **[2]**

a) $\frac{1}{2}$ b) $\frac{15}{16}$

c) $\frac{1}{4}$ d) $\frac{3}{4}$

P.T.O.

iii) 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]**

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

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

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

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

iv) If Langrange's interpolation polynomial passes through the points

x	0	2	3
y	1	3	2

then the value of y at $x = 1$ is **[2]**

a) $\frac{2}{3}$

b) $\frac{5}{3}$

c) $\frac{8}{3}$

d) $\frac{5}{4}$

v) Given equation is $\frac{dy}{dx}=f(x,y)$ with initial conditions $x=x_0, y=y_0$ and h is step size Euler's formula to calculate y_1 at $x = x_0 + h$ is given by _____. **[1]**

a) $y_1 = y_0 + hf(x_0, y_0)$

b) $y_1 = y_0 + hf(x_1, y_1)$

c) $y_1 = y_1 + hf(x_0, y_0)$

d) $y_1 = hf(x_0, y_0)$

vi) Coefficient of kurtosis β_2 is given by **[1]**

a) $\frac{\mu_4}{\mu_3}$

b) $\frac{\mu_4}{\mu_2^2}$

c) $\frac{\mu_3}{\mu_2^2}$

d) $\frac{\mu_4}{\mu_2^3}$

Q2) a) The first four moments of a distribution about the value 3.5 are 0.0375, 0.4546, 0.0609 and 0.5074. Find the first four central moments about the mean. **[5]**

b) Obtain regression line of x on y for the following data : **[5]**

x	6	2	10	4	8
y	9	11	5	8	7

c) Fit a linear curve $y = ap + b$ by using least square criteria **[5]**

p	100	120	140	160	180	200
y	0.90	1.10	1.20	1.40	1.60	1.70

OR

Q3) a) Calculate the coefficient of correlation from the information $n = 5$, $\Sigma x = 100$, $\Sigma x^2 = 230000$, $\Sigma y^2 = 80$, $\Sigma xy = 500$, $\Sigma y = 2$. **[5]**

b) Fit $y = ax^2 + bx + c$ to the given data where a, b, c are constants. **[5]**

x	–3	–2	–1	0	1	2	3
y	12	4	1	2	7	15	30

c) The line of regression of y on x is $8x - 10y + 66 = 0$ and the line of regression of x on y is $40x - 18y = 214$. Find **[5]**

i) the mean values of x and y

ii) correlation coefficient between x & y

Q4) a) A throw is made with two dice. Find the probability that : **[5]**

i) the sum is 7 or less

ii) the sum is a perfect square

b) The mean and variance of a binomial distribution are 4 and 2 respectively, find $p(r \leq 2)$. **[5]**

c) Assuming that the diameters of 1000 brass plugs taken consecutively from machine form a normal distribution with mean 0.7515 cm and standard deviation 0.0020 cm. How many of the plugs are likely to be approved if the acceptable diameter is 0.752 ± 0.004 cm? **[5]**

[Given A(2.25) = 0.4878, A(1.75) = 0.4599]

OR

Q5) a) An unbiased coin is thrown 10 times. Find the probability of getting **[5]**

i) exactly 8 Heads

ii) at least 8 heads

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

i) with no breakdown

ii) at most one breakdown

c) Demand for a particular spare part in a factory was found to vary from day to day. In a sample study the following information was obtained. **[5]**

Days	Mon	Tue	Wed	Thurs	Fri	Sat
No. of parts demanded	1124	1125	1110	1120	1126	1115

Test the hypothesis that the number of parts demanded does not depend on the day of the week.

(Given : $\chi^2_{5,0.05} = 11.07$)

Q6) a) Using the bisection method, find an approximate root of the equation $x\sin x - 1$, that lies between $x = 1$ and $x = 1.5$ (measured in radians). Perform six iterations. **[5]**

b) Obtain the root of the equation $x^3 - 4x - 9 = 0$ correct to four decimal places by using Newton-Raphson method. **[5]**

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

$$20x_1 + x_2 - 2x_3 = 17$$
$$3x_1 + 20x_2 - x_3 = -18$$
$$2x_1 - 3x_2 + 20x_3 = 25$$

OR

Q7) a) Solve the following system by Gauss - elimination method : **[5]**

$$4x_1 + x_2 + x_3 = 4$$
$$x_1 + 4x_2 - 2x_3 = 4$$
$$3x_1 + 2x_2 - 4x_3 = 6$$

b) Solve the following system of equations by Jacobi - iteration method : **[5]**

$$6x_1 + 2x_2 - x_3 = 4$$
$$x_1 + 5x_2 + x_3 = 3$$
$$2x_1 + x_2 + 4x_3 = 27$$

c) Use method of false position to find the root of the equation $x^4 - 32 = 0$ correct to three decimal places. **[5]**

Q8) a) Find the value of y at $x = 1.5$ for the following data using Newton's forward difference formula. **[5]**

x	0	2	4	6	8
y	5	29	125	341	725

b) Find the value of $\int_0^3 \frac{1}{1+x}dx$ by using Simpson's $\left(\frac{3}{8}\right)^{th}$ rule. Take $h = 0.5$ and correct the solution upto four decimal places. **[5]**

c) Use Euler's method to solve the equation $\frac{dy}{dx} = 1 + xy$ with y(0) = 1 and tabulate the solution for $x = 0$ to $x = 0.4$. Take $h = 0.1$ and correct the solution upto fourth decimal place. **[5]**

OR

Q9) a) Use Runge - Kutta method of fourth order to solve $\frac{dy}{dx} = \frac{1}{x+y}, y(0) = 1$ in the interval (0, 0.2) with $h = 0.2$ correct the solution upto fourth decimal place. **[5]**

b) Given $\frac{dy}{dx} = x^2 + y, y(0) = 1$ determine using modified Euler's method the value of y when $x = 0.05$. Take $h = 0.05$ and correct the solution upto fourth decimal place. Use two iterations only. **[5]**

c) Using Newton's backward difference formula find the value of y at $x = 3.5$ for the following data. **[5]**

x	0	1	2	3	4
y	3	2	3	6	11

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