Total No. of Questions : 9]

SEAT No. :

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S.E. (Computer Engineering)/(Computer Science & Design Engg.)/ (I.T.)/(AI & ML)

ENGINEERING MATHEMATICS-III

(2019 Pattern) (Semester-IV) (207003)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Q.No.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 indicates full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Choose the correct option of the following.

a) If the first four central moments of a distribution are 0, 2.5, 0.7 and 18.75 then the coefficient of Kurtosis β_2 is _____. **[2]**

i) 0 ii) 1

iii) 2 iv) 3

b) The probability distribution of x is **[2]**

x	1	2	3	4
P(x)	1/2	1/4	1/8	1/8

The mathematical expectation E(x) is ____

i) 11/8 ii) 13/8

iii) 15/8 iv) 9/8

c) A root of the equation $x^3 - 4x - 9 = 0$ using bisection method lies between____ **[2]**

i) 0 and 1 ii) 1 and 2

iii) 2 and 3 iv) 3 and 4

P.T.O.

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

x	0	2
y	–3	1

then $\int_0^2 y\,dx$ is equal to_____

i) –1 ii) –2

iii) 1 iv) 2

e) If $\bar{x}$ is arithmetic mean, N=Σf and the data is presented in the form of frequency distribution then the standard deviation σ is given by ___ **[1]**

i) $\frac{1}{N}\Sigma f\left(x-\bar{x}\right)^2$ ii) $\sqrt{\frac{1}{N}\Sigma f\left(x-\bar{x}\right)^2}$

iii) $\frac{\Sigma fx}{N}$ iv) $\frac{1}{N}\Sigma f\,|x-\bar{x}|$

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

i) $y_1=y_0+hf\left(x_0,y_0\right)$ ii) $y_1=y_0+hf\left(x_1,y_1\right)$

iii) $y_1=y_0+hf\left(x_0,y_1\right)$ iv) $y_1=hf\left(x_0,y_0\right)$

Q2) a) The first four moments of a distribution about the value 5 are 2,20,40 and 50. 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 of the type $y = ax + b$ to the data using method of least squares. **[5]**

x	0	1	2	3	4	5	6	7
y	–5	–3	–1	1	3	5	7	9

OR

Q3) a) Calculate the coefficient of correlation from the information $n=10$, $\Sigma x=40$, $\Sigma x^2=190$, $\Sigma y^2=200$, $\Sigma xy=150$, $\Sigma y=40$ **[5]**

b) Fit a curve $y=ax^b$ for the data **[5]**

x	2000	3000	4000	5000	6000
y	15	15.5	16	17	18

c) The two regression equations of the variables x and y are **[5]**

$x = 19.13 - 0.87y$ and $y = 11.64 - 0.50x$

Find mean of x and mean of y and coefficient of correlation.

Q4) a) A mathematics problem is given to the three students A, B, C whose chances of solving it are $\frac{1}{2}, \frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved? **[5]**

b) The mean and variance of a binomial distribution are 6 and 2 respectively. Find P ($r \geq 1$) **[5]**

c) A fair coin is tossed 64 times. Using normal distribution with mean 32 and standard deviation 4, find the probability of getting. **[5]**

i) Number of heads between 28 to 40

ii) Number of heads less than 28.

[Given: A(1) = 0.3413, A(2) = 0.4772]

OR

Q5) a) On an average a box containing 10 articles is likely to have 2 defectives. If we consider a consignment of 100 boxes, how many of them are expected to have three or less defectives? **[5]**

b) Let 10% of the rivets produced by a machine are defective. Using Poisson distribution find the probability that out of 5 rivets chosen at random, at least two will be defective. **[5]**

c) A nationalized 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	1	2	3	4
No. of customers observed	150	250	170	230

Test whether the customers are uniformly distributed over the windows.

(Given : $\chi^2_{3,0.05} = 7.815$)

Q6) a) Use secant method to find a root of the equation $f(x) = x^3 - 5x - 7 = 0$ correct to three decimal places. **[5]**

b) Obtain a root of the equation $3x - \cos x - 1 = 0$ (measured in radians), correct to four decimal places, using Newton-Raphson method. **[5]**

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

$$10x_1 + x_2 + x_3 = 12$$
$$2x_1 + 10x_2 + x_3 = 13$$
$$2x_1 + 2x_2 + 10x_3 = 14$$

OR

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

$$x_1 + 4x_2 - x_3 = -5$$
$$x_1 + x_2 - 6x_3 = -12$$
$$3x_1 - x_2 - x_3 = 4$$

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

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

c) Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of false position at the end of fifth iteration. **[5]**

Q8) a) Find value of y for $x = 0.5$ using Newton's forward difference formula for following data. **[5]**

x	0	1	2	3	4
y	1	5	25	100	250

b) Use Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule to find the value of $\int_1^2 \frac{1}{x}\,dx$. Take h = 0.25 correct solution upto fourth decimal place. **[5]**

c) Use Euler's method to solve the equation $\frac{dy}{dx} = x^2 + y$ with y(0)=1 and tabulate the solution for $x = 0$ to $x = 0.3$ take $h = 0.1$. **[5]**

OR

Q9) a) Use Runge-Kutta method of fourth order to solve $\frac{dy}{dx} = x^2 + y^2$, y(1)=1.5 in the interval (1, 1.1) with h=0.1 and correct upto four decimal places. **[5]**

b) Given $\frac{dy}{dx} = x^2 + y,\ y(0) = 1$, determine $y(0.02)$ by using modified Euler's method correct upto forth decimal places. Take h=0.02 (Two iterations only) **[5]**

c) Find the value of $f(4.5)$ using Newton's backward difference formula correct upto 4 decimal places for following data. **[5]**

x	1	2	3	4	5
$y=f(x)$	14	30	62	116	198