Total No. of Questions : 9]

SEAT No. : ____

PD-4080

[Total No. of Pages : 5

[6402]-40

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

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 side 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 :**

a) X is normally distributed. The mean of X is 15 and standard deviation 3. Given that for Z = 1, A = 0.3413 then P(X ≥ 12) is given by : **[2]**

i) 0.3413 ii) 0.8413

iii) 0.1587 iv) 0.6587

b) Among 64 off springs of a certain cross between guinea pig 34 were red, 10 were black and 20 were white. According to genetic model, these number should be in the ratio 9 : 3 : 4. Expected frequencies in the order are **[2]**

i) 36, 12, 16 ii) 32, 8, 24

iii) 36, 16, 12 iv) 34, 10, 20

c) Using Newton - Raphson method, the first approximation to a root x_1 of the equation $x^3 + 2x - 5 = 0$ in (1, 2) if initial approximation $x_0 = 2$ is ____ **[2]**

i) 0 ii) 3

iii) 1.5 iv) 4

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) The first central moment of a distribution about the mean is **[1]**

i) 1 ii) always positive

iii) 0 iv) –1

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) $\frac{a-b}{2}$ ii) $\frac{f(a)+f(b)}{2}$

iii) $\frac{a+b}{2}$ iv) $\frac{a-b}{a+b}$

Q2) a) The first four moments about the working mean 30.2 of a distribution are 0.255, 6.222, 30.211, 400.25. Calculate the first four central moments about the mean. **[5]**

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

x	2	3	5	7	9	10	12	15
y	2	5	8	10	12	14	15	16

c) Fit a linear curve $y = ax + b$ to the data : **[5]**

x	0	2	4	6	8	12	20
y	10	12	18	22	20	30	30

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) If regression line of x on y is $9x + y = \lambda$ and the regression line of y on x is $4x + y = \mu$ where means of x and y are 2 and –3 respectively. Find the values of λ and μ and the coefficient of correlation between x any y. **[5]**

Q4) a) Two cards are drawn from a well shuffled pack of 52 cards. Find the probability that they are both Queens if : **[5]**

i) the first card drawn is replaced

ii) the first card drawn is not replaced

b) A series of five one-day matches is to be played between India and Australia. Assuming that the result of all the five matches is independent and the probability of India's win in each match is 0.6, find the probability that India wins the series. **[5]**

c) A life time of a certain component has a normal distribution with mean of 400 hours and standard deviation of 50 hours. Assuming a normal sample of 1000 components, find number of components whose life time lies between 340 to 465 hours. **[5]**

[Given : A ($z = 1.2$) = 0.3849, A($z = 1.3$) = 0.4032]

OR

Q5) a) The mean and variance of a binomial distribution are 4 and 2 respectively. Find $P(r \leq 2)$. **[5]**

b) Number of road accidents on a high-way during a month follows a Poisson distribution with mean 5. Find the probability that in a certain month number of accidents on the highway will be **[5]**

i) less that 3

ii) more than 3

c) A die is tossed 300 times gave the following result. **[5]**

Score	1	2	3	4	5	6
Frequency	43	49	56	45	66	41

Is the data consistent at 5% level of significance with hypothesis that the die is unbiased?

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

Q6) a) Using method of bisection, find the cube root of 69. (five iterations) **[5]**

b) Find the root of the equation $x - e^{-x} = 0$ that lies between 0.5 and 1 by Newton Raphson method correct up to four decimal places. **[5]**

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

$$8x_1 + 3x_2 + 2x_3 = 13$$

$$x_1 + 5x_2 + x_3 = 7$$

$$2x_1 + x_2 + 6x_3 = 9$$

OR

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

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

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

$$x_1 + 4x_2 + 9x_3 = 16$$

b) Solve the following system of equations by Jacobi's iteration method. **[5]**

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

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

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

c) Solve the equation $f(x) = x - e^{-x}$ by Regula-Falsi method with the initial approximations 0.5 and 1 correct up to three decimal places. **[5]**

Q8) a) Using Newton's backward difference formula find the value of y at $x = 3.5$ for following data : **[5]**

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

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 the solution upto fourth decimal place. **[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 $\frac{dy}{dx} = x^2 + y^2, y(1) = 1.5$ in the interval (1, 1.1) with $h = 0.1$ and 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) Find the 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