Total No. of Questions : 9]

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S.E. (Computer/I.T./A.I & M.L/C.S & D.E.)

ENGINEERING MATHEMATICS - III

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

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Q1 is compulsory.*
2) *Attempt Q2 or Q3, Q4 or Q5, Q6 or Q7, Q8 or Q9.*
3) *Neat diagram must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of electronic pocket calculator is allowed.*
6) *Assume suiatable data, if necessary.*
7) *Write numerical calculations correct upto three decimal places.*

Q1) Write the correct option for the following multiple choice questions.

a) If the two regression coefficiens are $\frac{-8}{15}$ and $\frac{-5}{6}$ then the correlation coefficient is [2]

i) $\frac{-2}{3}$ ii) $\frac{2}{3}$

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

b) A and B are independent events such that $P(A)=\frac{1}{2}, P(B)=\frac{1}{3}$ then $P(A \cup B)$. [2]

i) $\frac{3}{5}$ ii) $\frac{2}{3}$

iii) $\frac{1}{6}$ iv) $\frac{1}{3}$

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c) Using Gauss elimination method the solution of system of equations $x + 2y + z = 4, -3y + 2z = -3, -7y + 2z = -6$ is [2]

i) $x=-\frac{-43}{16}, y=\frac{-9}{8}, z=\frac{15}{16}$ ii) $x=\frac{47}{20}, y=\frac{9}{10}, z=\frac{-3}{20}$

iii) $x=\frac{4}{3}, y=\frac{3}{8}, z=\frac{-5}{6}$ iv) $x=\frac{16}{43}, y=\frac{8}{9}, z=-5$

d) If a curve passing through (0,0), (2,4), (4,8) is given by $y = y_0 + u\,\Delta y_0$ then y at $x = 1$ is given by (Note : $x = x_0 + uh$) [2]

i) 1 ii) 0

iii) -1 iv) 2

e) The range of correlation coefficient 'r' for a bivariate data is [1]

i) $0 \le r < \infty$ ii) $-\infty < r < \infty$

iii) $-1 \le r \le 1$ iv) $0 \le r \le 1$

f) If x_0, x_1 are two initial approximations to the root of $f(x) = 0$, by secant method next approximation x_2 is given by [1]

i) $x_2 = x_1 - \frac{(x_1 - x_0)}{(f_1 - f_0)} \times f_1$ ii) $x_2 = \frac{x_0 + x_1}{2}$

iii) $x_2 = x_1 - \frac{f(x_1)}{f'(x_1)}$ iv) $x_2 = x_1 + \frac{(x_1 + x_0)}{(f_1 + f_0)} \times f_1$

Q2) a) The first four moments of distribution abut the value 4 are –1.5, 17, –30 and 108 respectively. Obtain the first four central moments about mean, β_1 and β_2. [5]

b) Firt a straight line of the form y = a + bx using least squares method to the following data. [5]

x	0	1	2	3	4
y	–2	1	4	7	10

c) The two regression lines of a bivariate data are $3x + 2y = 26$ and $6x + y = 31$. Find the mean values of x and y. Also, determine the correlation coefficient between x and y. [5]

OR

Q3) a) Calculate the coefficient of variation for the data given as follows. **[5]**
36, 15, 25, 10 and 14.

b) Fit a second degree parabola of the form $y = a + bx + cx^2$ using least squares method to the folowing data **[5]**

x	0	1	2	3
y	2	1	6	17

c) Find the correlation coefficient between the variables population density (x) and death rates (y) as given in the following data. **[5]**

x	200	400	500	700	300
y	12	18	16	21	10

Q4) a) Find the expected value of the sum of the faces obtained when two fair dice are tossed simultaneously. **[5]**

b) An unbiased coin is tossed five times. Find the probability of observing at least four heads. **[5]**

c) **In a sample of** 1,000 cases, the mean score in a certain examination is 14 **and standard deviation is 2.5. Assuming the distribution to be normal, find the expected number of students scoring between 12 and 15 (both inclusive).** **[5]**

[Given : $Z_1 = 0.4, A_1 = 0.1554, Z_2 = 0.8, A_2 = 0.2881$]

OR

Q5) a) A riddle is given to three students to solve independently. The individual probabilities of the riddle being solved by the three students are 0.3, 0.4 and 0.5 respectively. Find the probability that the riddle gets solved. **[5]**

b) On an average, there are two printing mistakes on a page of a book. Using Poision distribution, find the probability that a randomly selected page from the book has at least one printing mistake. **[5]**

c) In a mouse breeding experiment, a geneticist has obtained 172 brown mice with pink eyes, 60 brown mice with brown eyes, 62 white mice with pink eyes and 26 white mice with brown eyes. Theory predicts that these types of mice should be obtained in the ratios $9 : 3 : 3 : 1$. Test the compatibility of the data with theory, using 5% level of significance. [Given $\chi^2_{tab} = 7.815$] **[5]**

10
1/2

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

b) Obtain the real root of the quation $x^3 - 4x - 9 = 0$ by applying Newton. Raphson method at the end of third iteration. **[5]**

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

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

10

OR

Q7) a) Solve by Gauss elimination method, the system of equations : **[5]**

$$2x_1 + x_2 + x_3 = 10$$
$$3x_1 + 2x_2 + 3x_3 = 18$$
$$x_1 + 4x_2 + 9x_3 = 16$$

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

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

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

Q8) a) Using Newton's forward interpolation formula, find y at $x = 8$ from the data : **[5]**

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

b) Evaluate $\int_1^2 \frac{dx}{x^2}$ using Simpson's $\frac{1}{3}^{rd}$ rule, (Take $h = 0.25$). **[5]**

c) Use Euler's method to solve $\frac{dy}{dx} = 1 + xy$, $y(0) = 1$. Tabulate values of y for $x = 0$ to $x = 0.3$ (Take $h = 0.1$) **[5]**

OR

Q9) a) Use Runge-Kutta method of fourth order to solve $\frac{dy}{dx} = x + y^2, y(0) = 1$ at $x = 0.1$ with $h = 0.1$. [5]

b) Use modified Euler's method to find $y(0.1)$, given $\frac{dy}{dx} = 1 + xy, y(0) = 1$ and $h = 0.1$. (up to two iterations) [5]

c) Using Newton's backward difference formula, find the value of $\sqrt{155}$ from the data : [5]

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