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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Fourth Semester, B.E. – Make-up Examination, July/Aug. - 2015

Engineering Mathematics - IV

(Common to EE, EC, CS&E, IS&E Branches)

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer any **FIVE** full questions, selecting **ONE** full question from **each unit**.*

UNIT - I

1. a. Using the method of false position, find a real root of the equation $x^2-2x-5=0$ that lies between 2 and 2.5. (Correct to 3 decimal places). 6

b. Find a positive approximate real root of the equation $x+\log_{10} x=2$. Using Newton – Raphson method. Carryout the iterations upto four decimal places of accuracy. 7

c. Find the smallest root of the equation $f(x)=x^3-9x^2+26x-24=0$ by Ramanujan method. 7

2 a. Solve the differential equation $\frac{dy}{dx}=-xy^2$ given $y(0)=2$, by using the modified Euler's method, at the points $x=0.1$ and $x=0.2$. Take the step – size $h=0.1$ and carry out two iterations at each step. 6

b. Using the fourth order Range – Kutta method, solve the equation $\frac{dy}{dx}=\frac{1}{x+y}$ at the point $x=0.5$, given $y(0.4)=1$. Take step – length h = 0.1. 7

c. Apply Adams – Bash forth method to solve the equation $(y^2+1)dy-x^2dx=0$ at $x=1$, given the data, with $y(0)=1$, $y(0.25)=1.0026$, $y(0.5)=1.0206$, $y(0.75)=1.0679$. 7

UNIT – II

3 a. Show that $f(z)=Z^n$ is analytic. Hence find its derivative. 6

b. Find the analytic function $f(z)$, given $u=e^{-x}\left\{\left(x^2-y^2\right)\cos y+2xy\sin y\right\}$ 7

c. Discuss the transformation $w=z^2$ 7

4 a. Evaluate $\int_c z^2dz$, where c is the curve OAB consisting of two line segments :

i) OA from the point z = 0 to the point z = 2 and

ii) AB from the point z = 2 to the point z = 2 + i. 6

b. Expand $f(z)=\frac{z}{(z-1)(z-3)}$ as a Laurent's series in the regions i) $1<|z|<3$ and ii) $|z|>3$ 7

Contd…2

c. By using the Cauchy residue theorem, evaluate $\int_c \frac{2z^2+1}{(z+1)^2(z-2)}dz$. Where C is the circle $|z+1|=1$ 7

UNIT - III

5 a. The first four moments about the working mean 28.5 of a distribution are 0.294, 7.144, 42.409 and 454.98. Calculate the moments about the mean. Also evaluate β_1 & β_2. 6

b. Fit a parabola $y = a + bx + cx^2$ by the method of least square for the following data: 7

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

c. Obtain the lines of regressions and hence find the coefficient of correlation for the following data: 7

x	1	3	4	2	5	8	9	10	13	15
y	8	6	10	8	12	16	16	10	32	32

6. a. Find the value of k such that the following distribution represents a finite probability distribution. 6

x	0	1	2	3	4	5	6
p(x)	k	3k	5k	7k	9k	11k	13k

Also find $p(x > 4)$ and $p(3 < x \leq 6)$.

b. The probability of a man aged 60 will live to be 70 is 0.65. What is the probability that act of 10 men, now aged 60, i) exactly 9 will live to be 70, ii) at most 9 will live to be 70 iii) at least 7 will live to be 70 ? 7

c. In a normal distribution, 7% are under 35 and 89% are under 63. Find the mean and the standard deviation given that A(1.23) = 0.39 and A(1.48) = 0.43 in the usual notation. 7

UNIT - IV

7 a. Find a constant k so that

$$f(x,y) = \begin{cases} k(x+1)e^{-y}, & 0 < x < 1, y > 0 \\ 0, & \text{else where} \end{cases}$$ 6

Is a joint probability density function. Are *x* and *y* independent?

b. The joint distribution of two random variable X and Y as follows: 7

X \ Y	-2	-1	4	5
1	0.1	0.2	0	0.3
2	0.2	0.1	0.1	0

Find; (i) Marginal probability distribution of X and Y (ii) Cov (X, *Y*)

c. Define the regular stochastic matrix. Find the unique fixed probability vector of the regular stochastic matrix. 7

$$A = \begin{pmatrix} 1/2 & 1/4 & 1/4 \\ 1/2 & 0 & 1/2 \\ 0 & 1 & 0 \end{pmatrix}$$

8 a. Define; i) Absorbing state ii) Transient state iii) Recurrent state of a Markov chain. 6

b. Each year a man trades his car for a new car in 3 brands. If he has a 'standard' he trades it for 'Zen'. If he has a 'Zen' he trades it for a 'Esteem'. If he has a 'Esteem' he is just as likely to trade it for a new Esteem or for a Zen or a standard one. In 1996 he bought his first car which was Esteem. Find the probability that he has i) 1998 Esteem ii) 1998 standard iii) 1999 Zen. 7

c. A coin is tossed three times. Let X denote 0 or 1 according as a tail or head occurs on the first toss. Let Y denote the total number of tails which occur. Determine; 7

i) The marginal distributions of X and Y

ii) Joint distribution of X and Y. Also find the expected values of X + Y

UNIT - V

9 a. Define; (i) Vector space and (ii) Subspace with suitable examples. 6

b. Define basis of a vector space. Is the set {(1, 2, 1), (2, 1, 0) (1, -1, 2)} a basis for the vector space R^3? 7

c. Define a linear transformation. Find the rank and nullity of the transformation $T : V_2(R) \rightarrow V_2(R)$ defined by $T(x_1, x_2) = (x_1 + x_2, x_1)$ 7

10 a. Solve the following system of equations by Gauss – Seidel method 6

$$20x + y - 2z = 17,\ 3x + 20y - z = -18\ \ 2x - 3y + 20z = 25.$$

(Carryout three iterations.)

b. Solve by the Relaxation method, the system of equations 7

$$5x + 2y + z = 12,\quad x + 4y + 2z = 15,\quad x + 2y + 5z = 20.$$

c. Find the dominant Eigen value and the corresponding Eigen vector of the matrix. 7

$$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$

By power method taking $(1, 1, 1)^T$ as the initial Eigen vector.

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