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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; Jan/Feb - 2017

Engineering Mathematics - IV

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

Time: 3 hrs *Max. Marks: 100*

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

UNIT - I

1 a. Find the positive root of $x^4 - x = 10$ correct to three decimal places using Newtons-Raphson Method (Carry out 3 iterations). 6

b. Find the root of the equation $x\log_{10} x = 1.2$, using the Regula-Falsi method. Correct four decimal places (carry out 4 iterations). 7

c. Find the smallest root of the equation $x^3 - 6x^2 + 11x - 6 = 0$ using Ramanujan's method. 7

2 a. Employ Taylor's method to obtain approximate value of y at x = 0.2 for the differential equation $\frac{dy}{dx} = 2y + 3e^x,\ y(0) = 0$. 6

b. Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at $x = 0.2$ and 0.4. 7

c. If $\frac{dy}{dx} = 2e^x - y,\ y(0.1) = 2.010,\ y(0.2) = 2.040,\ y(0.3) = 2.090$ find, $y(0.4)$ correct to four decimal places by using Adams-Bashforth method. 7

UNIT - II

3 a. Show that $f(z) = \cosh z$ is analytic and hence find $f'(z)$. 6

b. Find the analytic function $f'(z)$ whose imaginary part is $e^x(x\sin y + y\cos y)$. 7

c. Discuss the transformation $w = z + \frac{1}{z},\ z \neq 0$. 7

4 a. Evaluate: $\int_c z^2 dz$ along the straight line from $z = 0$ to $z = 3 + i$. 6

b. Expand: $f(z) = \frac{1}{(z-1)(2-z)}$ as a Laurent's series valid for, 7

i) $|z| = 1$ ii) $|<|z| < 2$ iii) $|z| > 2$.

c. Evaluate: $\int_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz$ where $c : |z| = 3$. 7

UNIT - III

5 a. The first four moments about the working mean 28.5 of a distribution are 0.204, 7.144, 42.409 and 454.98. Calculate the β_1 and β_2. 6

b. Fit a curve of form $y = ab^x$ in the least square sense for the following data : 7

x:	0	2	4	5	7	10
y:	100	120	256	390	710	1600

c. Show that, if θ is the angle between the lines of regression, then $\tan\theta = \frac{\sigma_x \sigma_y}{\sigma_x^2 \sigma_y^2}\left(\frac{1-r^2}{r}\right)$. 7

6 a. The p.d.f. of a variate x is given by the following table : 6

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

i) Find K ii) Evaluate $p(x \geq 5)$ iii) $p(3 < x \leq 6)$.

b. The probability that a person aged 60 years will live upto 70 years is 0.65. What is the probability that out of 10 persons aged 60 at least 7 of them will live upto 70? 7

c. The marks of 1000 students in an examination follows a normal distribution with mean 70 and standard deviation 5. Find the number of students whose marks will be, 7

i) Less than 65 ii) More than 75 iii) Between 65 and 75. Given $\phi(1) = 0.3413$.

UNIT - IV

7 a. The joint distribution of two random variables X and Y is as follows : 6

X \ Y	-4	2	7
1	$1/8$	$1/4$	$1/8$
5	$1/4$	$1/8$	$1/8$

Find :

(i) Marginal probability distribution of X and Y ii) E(X) and E(Y) iii) E(XY).

b. Find the unique fixed probability vector for the regular stochastic matrix. 7

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 1/6 & 1/2 & 1/3 \\ 0 & 2/3 & 1/3 \end{bmatrix}$$

c. The joint density function of two continuous random variables x and y is given by, 7

$$f(x,y) = \begin{cases} Kxy & : 0 \leq x \leq 4, \quad 1<y<5 \\ 0 & \text{otherwise} \end{cases}$$

Find: (i) The value of K ii) E(X) iii) E(Y) iv) E(XY).

Contd......3

8 a. Define : 6

i) Auto correlation ii) Auto covariance iii) Correlation coefficient.

b. Three boys A, B, C are throwing ball to each other. A always throws the ball to B and B always throws the ball to C. C is just as likely to throw the ball to B as to A. If C was the first person to throw the ball. Find the probability that after three throws, 7

i) A has the ball ii) B has the ball iii) C has the ball.

c. Define the M / M / 1 Queuing system. In a bus stand there is a single counter for issuing tickets. On an average 12 commuters arrive every 10 minutes. The counter clerk is able to issue 8 tickets in a span of 5 minutes. Find : 7

i) Average number of commuters in the queue

ii) Average waiting time in the queue.

UNIT - V

9 a. Define subspace with suitable example. 6

b. Define linearly dependent and independent vectors. Prove that $u_1(1, 0, 0)$, $u_2(0, 1, 0)$, $u_3(0, 0, 1)$ are linearly independent. 7

c. Define linear transformation. Find the rank and nullity of the linear transformation, 7

$T : R^4 \to R^3$ by $T(x, y, z, t) = (x - y + z + t,\ 2x - 2y + 3z + 4t,\ 3x - 3y + 4z + 5t)$.

10 a. Solve by Gauss-Seidel iteration method the equations, 6

$20x + y - 2z = 17;\ \ 3x + 20y - z = -18;\ \ 2x - 3y + 20z = 25$ (Carry out 3 iterations).

b. Solve the system of equations: $12x + y + z = 31;\ \ 2x + 8y - z = 24;\ \ 3x + 4y + 10z = 58$ using Relaxation method. 7

c. Determine the largest Eigen value and the corresponding Eigen vector of the matrix using power method taking initial Eigen vector $[1, 0, 0]^T$ (perform 6 iteration). 7

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

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