

Name:.....

Reg. No:.....

A

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH DEGREE EXAMINATIONS

Branch: Electrical & Electronics Engineering

(Specialization: Power Systems)

04MA 6303 - Applied Mathematics

(Note: Non-programmable calculators may be permitted)

Time: Three hrs

Max. Marks: 60

PART A

(Answer all questions. Each question carries 3 marks)

1. Evaluate the inverse Z transform of $\frac{z^2}{(z-a)(z-b)}$ (3)

2. Find Fourier cosine transform of e^{-ax} . (3)

3. If $I = \int_a^b \sin^2 x \tan \frac{y}{x} dx$, then solve I . (3)

4. Form the differential equation corresponding to $y(x) = \int_0^x (x+t)y(t) dt + 1$. (3)

5. Prove that arithmetic mean of an arbitrary distribution will be an unbiased estimator of the population mean. (3)

6. Write the standard five point formulæ for solution of Laplace's equation using a four-node mesh grid. (3)

7. Check the independence of $\{(1, 1, 2), (-1, 0, 1), (0, -2, 1)\}$ in \mathbb{R}^3 . (3)

8. Find the dimension and basis of $S \subset \mathbb{R}^3$, if $S = \{(x, y, z) | x - y - 7z = 0\}$ (3)

PART B

(Answer all questions. Each full question carries 6 marks)

9. Find Fourier Sine transform of $f(x) = e^{-|x|}$. Hence show that (6)

$$\int_0^{\infty} \frac{x \sin mx}{1+x^2} = \frac{\pi e^{-m}}{2}, m > 0.$$

OR

10. Solve $y_{n+2} + 6y_{n+1} + 9y_n = 5^n, y_0 = y_1 = 0$ using Z transform. (6)

11. Find the curve passing through the points $P(x_1, y_1)$ and $(Q(x_2, y_2))$ which when rotated about x -axis gives minimum surface area. (6)

OR

12. Prove that the shortest distance between two points in a plane is a straight line. (6)

13. A man chooses a car, train or bus to reach his office. From the past information it was found that (6)

the transition probability matrix is given by $\begin{pmatrix} 0.2 & 0.5 & 0.1 \\ 0.3 & 0.2 & 0.5 \\ 0.1 & 0.2 & 0.5 \end{pmatrix}$. The columns are respectively represent the probability for choosing a car, train and bus respectively in current day. In the first day of his travel, he tossed a fair coin and decided to catch a train if turn a head and to choose a bus if a tail turned. Use this assumption estimate the chance for choosing a car after second day and the long run probability measures for the choice of transportation.

OR

14. Discuss briefly the Fisher's characteristics of a good estimate. (6)

15. Show that $y = 2 - x$ is a solution of $\int_0^x e^{x-t} y(t) dt = e^x + x - 1$. (6)

OR

16. Solve $y(x) = 3x^2 + \int_0^x \cos(x-t)y(t) dt$. (6)

17. Fit a least square trend line to the data $y(0) = 3, y(1) = 5, y(2) = 7, y(3) = 12, y(4) = 19$. (6)

OR

18. Classify the Poisson's equation $\nabla^2 U = -10(x^2 + y^2 + 10)$ and solve it numerically over the square mesh with $U = 0$ on the boundary and mesh length=1. (6)

19. Prove that set of all $m \times n$ real matrices over the field of real numbers form a vector space. (6)

OR

20. Define an inner product space. Check whether $\langle x, y \rangle = x_1 y_1 - x_2 y_1 - x_1 y_2 + 4x_2 y_2$ defines an inner product in \mathbb{R}^2 . (6)