APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH. DEGREE EXAMINATION, FEBRUARY, 2016

Electrical and Electronics Engineering

(Power Systems)

04 MA 6303 – APPLIED MATHEMATICS

Time: 3hours Max. Marks: 60

Part A

(Answer all Questions. Each Question carries 3 marks.)

1) Find the Z-transform of $3n - 4\sin\frac{n\pi}{4} + 5a$, a is a constant.

2) If $I = \int_a^b \log(x + y^2 - 3xy)\, dx$, then form a functional from I.

3) Show that the integral equation $y(x) = \int_0^x \frac{t}{1+x^2} y(t)dt + 1$ is equivalent to the differential equation $y''(x) - 2xy'(x) - 3y(x) = 0; \quad y(0) = 1,\ y'(0) = 0$

4) What do you mean by efficiency of a Statistic? Give a statistical method to prove a statistic is efficient
Form normal equations for an Exponential curve fitting in least square method with n- data.

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6) Describe the natural cubic spline model for a non-linear curve fitting with n consecutive time intervals.

7) Let P_n denotes the set of all polynomials in the real variable x with real coefficients having degree $\leq n$. Show that P_n is a vector space over $\mathbb{R}$.

8) Define Inner product Spaces. Using standard inner product of $\mathbb{R}^n$, evaluate$< x, y >$ for $x = (1,2,4)$, $y = (-1, 0, \frac{1}{4})$

$(8 \times 3 = 24$ Marks)

Part B

(Answer all questions. Each carries 6 marks)

9) a) Find the Fourier Transform of $f(x) = \begin{cases} 1 - x^2, if\ |x| < 1 \\ 0, \quad if\ |x| > 1 \end{cases}$. And use it to evaluate

$$\int_0^\infty \left(\frac{xcosx - sinx}{x^3}\right) \cos\frac{x}{2} dx$$

Or

b) Find the response of the system using Z-transform method

$$y_{n+3} + y_{n+2} - 8y_{n+1} - 12y_n = 0, \quad y_0 = 1, y_1 = y_2 = 0$$

10) a) Find the plane curve of fixed perimeter and maximum area.

Or

b) Find the extremas of $\int_{x_0}^{x_1}(y')^2/x^3 dx$

11) a) Solve the integral equation $y(x) = x^2 + \int_0^x y(t)\sin(x-t)\,dt$ using transform method.

Or

b) Solve the Fredholm Integral equation $y(x) = sinx + \lambda\int_0^{2\pi}\cos(x+t)\,y(t)$ using successive approximation method.

12) a) Prove that sample mean is an unbiased Estimator.

Or

b) For random sample from normal populations$N(\mu, \sigma^2)$. Find M.L.E for μ when σ^2 is known.

13) a) The table below gives the temperature T$(in\ ^0C)$ and length $l(in\ mm)$of heated rod. If $l = a_0 + a_1T$, find the best value for a_0 and a_1.

T$(in\ ^0C)$	20	30	40	50	60	70
$l(in\ mm)$	800.3	800.4	800.6	800.7	800.9	801.0

Or

b) Solve the equation $\nabla^2 u = 8x^2y^2$ over the square mesh with $u = 0$ on the boundary and mesh length 1.

14) a) Prove that a set $S = \{v_1, v_2, \ldots \ldots . v_n\}$ of a vector space V is a basis for V if and only if every vector v in V can be uniquely expressed as a linear combination of v_i's.

Or

b) Let $V$and W be finite dimensional vector spaces over the field $\mathbb{F}$ with $\dim V = \dim W$ and $T: V \to W$ be linear transformation. Then prove that the following statements are equivalent.

i) T is invertible

ii) T is one to one

iii) T is onto, $i.e.$ $R(T) = W$

$(6 \times 6 = 36$ Marks)