

310601/310501

Roll No. _____

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B. Tech. III - Sem. (Main) Exam., (Academic Session 2021- 2022)

Electrical Engineering
3EE2 – 01 Advance Mathematics
Common EE/EEE

Time: 2½ Hours

Maximum Marks: 120
Min. Passing Marks:

Instructions to Candidates:

Part – A: Short answer questions (up to 25 words) 6×3 marks = 18 marks.
Candidates have to answer six questions out of ten

Part – B: Analytical/Problem solving questions 3×10 marks = 30 marks.
Candidates have to answer three questions out of eight.

Part – C: Descriptive/Analytical/Problem Solving questions 3×24 marks = 72 marks.
Candidates have to answer three questions out of five.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. Scientific Calculator

2. NIL

PART – A

~~Q.1~~ Define operator Δ , ∇ and show that $(I+\Delta)(I-\nabla) = 1$.

Q.2 Prove that $\mu^2 = I + \frac{\delta^2}{4}$.

~~Q.3~~ State Simpson's 3/8 rule.

Q.4 Find the Laplace transform of $\cos^3 2t$.

~~Q.5~~ Find the Inverse Laplace transform of $\frac{1}{s(s^2+4)}$.

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Q.6 Find the Fourier sine transform of $f(x)$, where $f(x) = \begin{cases} 1; & \text{for } 0 < x < a \\ 0; & \text{for } x > a \end{cases}$

Q.7 Find Z-transform of $u_n = n^2 a^n, n \geq 0$

Q.8, Find $Z^{-1}\left[\frac{z}{(z+2)^2}\right]$

Q.9 Prove that $u = e^x(x \cos y - y \sin y)$. Determine its harmonic conjugate.

~~Q.10~~ Define Bilinear Transformation.

PART - B

Q.1 Define operator δ and μ , and prove that $\delta[f(x)g(x)] = \mu[f(x)]\delta[g(x)] + \mu[g(x)]\delta[f(x)]$

~~Q.2~~ Given the following pairs of values of x and y -

$x : 5 \quad 6 \quad 9 \quad 11$

$y : 12 \quad 13 \quad 14 \quad 16$

Interpolate the value of y at $x = 10$, using Lagrange's interpolation formula.

Q.3 Compute the value of $\int_0^6 \frac{dx}{1-x^2}$ by the

(i) Trapezoidal Rule.

(ii) Simpson's 1/3 Rule

(iii) Simpson's 3/8 Rule and compare your result with the true value.

Q.4 Find the real root of the equation $x^2 - 5x + 3 = 0$. Correct to four places of decimals by Newtons-Raphson (N-R) method.

~~Q.5~~ Find the Laplace transform of $\sin\sqrt{x}$.

Q.6 Obtain the Fourier transform of $f(x) = \begin{cases} x^2; & \text{for } |x| \leq a \\ 0; & \text{for } |x| > a \end{cases}$

Q.7 Show that the transformation $w = \frac{2z+3}{z-4}$

~~Q.8~~ Determine the analytic function $w = u + iv$, if $u = e^{2x}(x \cos 2y - y \sin 2y)$.

PART - C

Q.1 The ordinates of the normal curve are given by the following table:

x :	0.0	0.2	0.4	0.6	0.8
y :	0.3989	0.3910	0.3683	0.3332	0.2897

Evaluate (i) $y(0.25)$ (ii) $y(0.62)$ (iii) $y(0.43)$

Q.2 Use the Regula-falsi method to solve $2x - \log_{10}x = 7$.

Q.3 Apply convolution theorem to evaluate:

$$L^{-1}\left[\frac{s}{(s^2+a^2)^2}\right]$$

Q.4 Solve : $u_{n+2} + 6u_{n+1} + 9u_n = 2^n$ given $u_0 = u_1 = 0$

Q.5 If $f(z)$ is a regular function of z , prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |f(z)|^2 = 4 |f'(z)|^2$

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