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3E1141

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B. Tech. III - Sem. (Main / Back) Exam., Dec. 2019
BSC Electrical & Electronics Engineering
3EE2-01 Advance Mathematics
Common For EE, EX

Time: 3 Hours

Maximum Marks: 120

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

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. NIL

2. NIL

PART - A

(Answer should be given up to 25 words only)

[10×2=20]

All questions are compulsory

Q.1 Evaluate: $\Delta^6(ax - 1)(bx^2 - 1)(cx^3 - 1)$

Q.2 Prove that : $E = 1 + \frac{\delta^2}{2} + \delta \sqrt{1 + \frac{\delta^2}{4}}$

Q.3 Find Laplace transform of $(t + 2)^2 e^t$.

Q.4 Find inverse Laplace transform of $\frac{s}{s^2+9} e^{-\left(\frac{2\pi}{3}\right)s}$

Q.5 State convolution theorem for Laplace Transform.

Q.6 Find the Fourier cosine transform of $f(x)$:

$$f(x) = \begin{cases} 1 & 0 < x < a \\ 0 & x > a \end{cases}$$

Q.7 Find Z – transform of $a^n \cos n\theta$.

Q.8 Define analytic function and write C – R equations.

Q.9 Show that $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 2x + 1$ satisfy the Laplace equation.

Q.10 Find the bilinear transformation which maps the points $Z_1 = 1$.

PART – B

(Analytical/Problem solving questions)

[5×8=40]

Attempt any five questions

Q.1 Use Gauss forward Interpolation formula to evaluate y_{30} . Given that -

$$y_{21} = 18.4708, y_{25} = 17.8144, y_{29} = 17.1070, y_{33} = 16.3432, y_{37} = 15.5154$$

Q.2 Evaluate $\int_{-1.6}^{-1} e^x dx$ by Simpson $\frac{1}{3}$ rule with 6 intervals.

Q.3 Find the real root of equation $x \log_{10} x - 1.2 = 0$ correct to three decimal places.

Q.4 Define Dirac delta function and obtain its Laplace transform.

Q.5 Find inverse Laplace transform of $\frac{1}{s^3(s^2+1)}$.

Q.6 Using Z – transform solve the following difference equation $6u_{n+2} - u_{n+1} - u_n = 0$, where

$$u_0 = 0, u_1 = 1 \quad n \geq 0. \quad \text{http://www.rtuonline.com}$$

Q.7 Determine the real part of an analytic function if imaginary part of $V = \frac{x-y}{x^2+y^2}$.

PART - C

(Descriptive/Analytical/Problem Solving/Design Questions) [4×15=60]

Attempt any four questions

Q.1 Find the first, second and third derivatives of $f(x)$ at $x = 1.5$ if -

x	1.5	2.0	2.5	3.0	3.5	4.0
$y = f(x)$	3.375	7.000	13.625	24.000	38.875	59.000

Q.2 Find approximate value of y for $x = 0.2$, if $\frac{dy}{dx} = x + y^2$ using Runge - Kutta method,

Given $y = 1$ at $x = 0$.

Q.3 Express the function :

$$f(x) = \begin{cases} \frac{2}{\pi} \sin x & 0 \leq x \leq \pi \\ 0 & x > \pi \end{cases}$$

as Fourier sine integral and hence evaluate

$$\int_0^{\infty} \frac{\sin \pi \lambda \sin x \lambda}{(1-\lambda^2)} d\lambda$$

Q.4 Show that $\omega = \frac{z-a}{z+a}$, $a > 0$ transform the plane $x > 0$ to unit circle $|\omega| < 1$. Also find the

transform of $|\omega| = \text{constant}$ in the z - plane.

Q.5 Prove that $L \left[\frac{\sin^2 t}{t} \right] = \frac{1}{4} \log \left(\frac{s^2+4}{s^2} \right)$

Hence deduce $\int_0^{\infty} \frac{\sin^2 t}{t} dt = \frac{\pi}{2}$