

(16)

No. of printed pages:02

SARDAR PATEL UNIVERSITY
B.Sc. (SEM-IV) Examination(Regular & NC)
Wednesday, 13th April, 2016

USO4EMTHO1: (Boolean Algebra and Laplace Transforms)

Time: 10:30 a.m. to 12:30 p.m.

Maximum Marks : 70

Note: Figures to the right indicate marks to the questions.

Q.1 Answer the following by selecting the correct choice from the given options. [10]

- (1) $a + 1 =$ _____
(a) a (b) 0 (c) 1 (d) none
- (2) $a \cdot a' =$ _____
(a) 0 (b) a (c) 1 (d) a'
- (3) If a and b are two elements of B , then $a \leq b$ implies _____
(a) $ab = 0$ (b) $ab' = 0$ (c) $aa' = 0$ (d) $ab' > 0$
- (4) In Bisection method, $x^3 - 9x + 1 = 0$; $a = 2$ and $b = 3$ then $x_0 =$ _____
(a) 2 (b) 3 (c) 1.5 (d) 2.5
- (5) Newton Raphson method is used for _____
(a) Interpolation (b) approximation of root of an equation
(c) approximation of derivative of a function (d) none
- (6) $L(\sin at) =$ _____
(a) $\frac{a}{s^2 - a^2}$ (b) $\frac{1}{s^2 - a^2}$ (c) $\frac{a}{s^2 + a^2}$ (d) $\frac{1}{s^2 + a^2}$
- (7) $L(1) =$ _____
(a) s (b) s^2 (c) $\frac{1}{s}$ (d) $\frac{1}{s^2}$
- (8) $L[e^{at}] =$ _____
(a) $\frac{1}{s-a}$ (b) $\frac{1}{s+a}$ (c) $\frac{a}{s+a}$ (d) $\frac{1}{s-a}$
- (9) $L^{-1}\left[\frac{1}{s-a}\right] =$ _____
(a) $\cos at$ (b) e^{at} (c) $e^{at} \cos bt$ (d) $\cosh at$
- (10) $L^{-1}\left[\frac{s}{s^2 - a^2}\right] =$ _____
(a) $\cosh at$ (b) $\cos at$ (c) $\sinh at$ (d) $\sin at$

[20]

Q.2 Answer ANY TEN of the following:

- (1) Define: Boolean Algebra and there properties.
- (2) State principal of duality.
- (3) For $a \in B$, prove that $a \cdot 0 = 0$
- (4) Define Algebraic equation with example.
- (5) Define Transcendental equation with example.
- (6) When Iteration method is applicable to find root of $f(x)=0$?
- (7) Define Laplace Transform.
- (8) State Linearity Property.
- (9) State First shifting Theorem.
- (10) Define Inverse Laplace Transform.
- (11) State shifting property for Inverse Laplace transform.
- (12) State Convolution Theorem.

(1)

(P.T.O.)

Q.3

- (a) In every Boolean Algebra B, Prove that binary operation (+) is associative. [5]
- (b) Prove that the element a' associated with element a in a Boolean algebra is unique. [5]

OR

Q.3

- (a) State and prove De-Morgan's laws for Boolean algebra B. [5]
- (b) Draw the network represented by Boolean function $x(xy+x'+xy')$ and simplify it. [5]

Q.4

- (a) Find the real root of the equation $f(x) = x^3 - x - 1 = 0$, correct up to 3 decimal places by using Bisection Method. [5]
- (b) Find the real root of the equation $f(x) = x^3 + x^2 - 1 = 0$, correct up to 4 decimal places by using Iteration Method. [5]

OR

Q.4

- (a) Find the real root of the equation $f(x) = x^3 - 2x - 5 = 0$, correct up to 3 decimal places by using False Position Method. [5]
- (b) Find the real root of the equation $2x = \cos x + 3$, correct up to 3 decimal places by using Aitken's Δ^2 Method. [5]

Q.5

- (a) Prove that $L(\sinh at) = \frac{a}{s^2 - a^2}$, $s > |a|$ [5]
- (b) Find Laplace transform of $\sin 2t \sin 3t$ [5]

OR

Q.5

- (a) If $L\{f(t)\} = F(s)$ then prove that $L\{t^n f(t)\} = (-1)^n \frac{d^n}{ds^n} [F(s)]$, where $n = 0, 1, 2, \dots$ [5]

- (b) Evaluate $\int_0^\infty te^{-2t} \sin t dt$ [5]

- Q.6 Find the inverse Laplace transform of $\frac{s+3}{s^2-4s+13}$, by using shifting theorem. [10]

OR

- Q.6 Apply convolution theorem to evaluate $L^{-1}\left(\frac{s}{(s^2+a^2)^2}\right)$. [10]

————— X —————

(2)