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16/A-9 SEAT No._____ No of printed pages : 3

SARDAR PATEL UNIVERSITY
B.Sc.(SEMESTER - IV) EXAMINATION - 2019
Friday , 12th April , 2019
MATHEMATICS : US04EMTH01
(Boolean Algebra and Laplace Transforms)

Time : 10:00 a.m. to 12:00 noon Maximum Marks : 70

Que.1 Fill in the blanks. 10

(1) $(a')' =$ .....

(a) a' (b) $(a')^2$ (c) a (d) a^2

(2) $a+(a.b) =$ .....

(a) a (b) b (c) $a.b$ (d) $a+b$

(3) $a.(a+b) =$ .....

(a) b (b) a (c) a+b (d) a.b

(4) Mid points of successive interval used for approximation of root an equation in.....

(a)False position method (b) Bisection method (c) Iteration method (d) Aitken's Δ^2 process

(5) Aitken's Δ^2 process is used for finding approximation .....

(a)Derivative of a function (b) Integral of a function (c) Root of equation (d) None

(6) Initial approximation of $x^3 - x - 2 = 0$ can be chosen from .....

(a) [0,1] (b) [-1,0] (c) [1,2] (d) [-2,-1]

(7) L[$cosat$] = ...

(a) $\frac{s}{s^2+a^2}$ (b) $\frac{a}{s^2+a^2}$ (c) $\frac{a}{s^2-a^2}$ (d) $\frac{s}{s^2-a^2}$

(8) L[$sinhat$] = ...

(a) $\frac{a}{s^2-a^2}$ (b) $\frac{a}{s^2+a^2}$ (c) $\frac{s}{s^2+a^2}$ (d) $\frac{s}{s^2-a^2}$

(9) $L^{-1}[\frac{1}{s^2+a^2}] =$ .....

(a) $\sin at$ (b) $\frac{1}{a}\sin at$ (c) $\sinh at$ (d) $a\sin at$

(10) If $L^{-1}\{f(s)\} = f(t)$, then $L^{-1}\{f(s-a)\} =$ .....

(a) $e^{at}f'(t)$ (b) $e^{at}f(t)$ (c) $f(t)$ (d) None

Que.2 Answer the following (Any Ten) 20

(1) For every element a and b in Boolean algebra B,prove that $a+1=1$ and $a\cdot 0 = 0$.

(2) Define Boolean Algebra and state its Properties.

(3) If $a+x = b+x$ & $a+x' = b+x'$ then prove that $a=b$.

(4) Define Algebric and Transcendental Equation .

(P.T.O.)

(5) Find the real root of the equation $f(x) = x^3 - x - 1 = 0$.

(6) Find cube root of 18 .

(7) Prove that $L(e^{at}) = \dfrac{1}{s-a}$, $s > a$.

(8) Prove that $L(\sin at) = \dfrac{a}{s^2+a^2}$, $s > 0$.

(9) Find laplace transform of $t \cos at$.

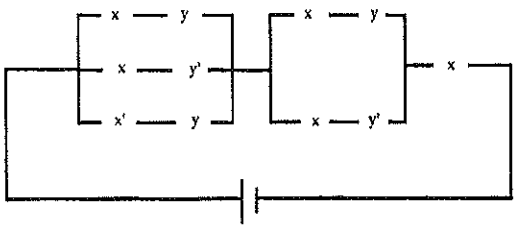
(10) Prove that $L^{-1}\left[\dfrac{1}{s-a}\right] = e^{at}$.

(11) Prove that $L^{-1}[\dfrac{s}{s^2+a^2}] = \cos at$.

(12) Find the inverse Laplace transform of $\dfrac{s^2-3s+4}{s^3}$.

Que.3 (a) In every Boolean algebra B, prove that each of the binary operations $(+)$ and $(\cdot)$ is associative. 5

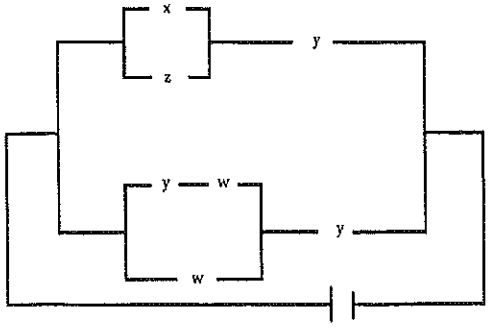
(b) Find the Boolean function of switching circuit given here and then it's equivalent simplified circuit , also draw the simplified circuit . 5



OR

Que.3 (c) Prove that in Boolean algebra , every triple of elements a, b, c satisfies the identity $ab + bc + ca = (a+b)(b+c)(c+a)$. 5

(d) Find the Boolean function of switching circuit given here and then it's equivalent simplified circuit , also draw the simplified circuit . 5



Que.4 (a) Solve the equation $f(x) = x^2 - 2x - 5 = 0$, correct up to 3 Significant digits by using Bisection Method. 5

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

OR

Que.4 (c) Find the real root of the equation $f(x) = x^3 - 4x - 9 = 0$,correct up to 3 decimal places by using False Position Method. 5

(d) Using Newton Raphson Method find the real root of the equation $f(x) = x^3 - 2x - 5 = 0$,correct up to 3 decimal places. 5

Que.5 (a) Find Laplace transform of $\sin^3 2t$. 3

(b) If $L\{f(t)\} = f(s)$ then prove that $L\{t^n f(t)\} = (-1)^n \frac{d^n}{ds^n}[\overline{f}(s)]$, where $n = 0, 1, 2, \ldots$. 3

(c) Evaluate $\int_0^\infty te^{-2t} \sin t \, dt$. 4

OR

Que.5 (d) Find Laplace transform of $te^{-t} \sin 4t$. 3

(e) Evaluate $L\left\{\int_0^t \frac{e^t \sin t}{t} dt\right\}$. 3

(f) Prove that $L(\cosh at) = \frac{s}{s^2 - a^2}$, $s > |a|$. 4

Que.6 (a) Find the inverse Laplace transform of $\frac{4s + 5}{(s-1)^2(s+2)}$. 5

(b) Find the inverse Laplace transform of $\frac{s}{(s+2)^2}$, by using shifting Theorem . 5

OR

Que.6 (c) Find the inverse Laplace transform of $\frac{2s^2 - 6s + 5}{s^3 - 6s^2 + 11s - 6}$. 5

(d) Find the inverse Laplace transform of $\frac{s^2}{(s-2)^3}$, by using shifting Theorem . 5

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