

[20/A-19]

SARDAR PATEL UNIVERSITY  
B.Sc.(SEMESTER - IV) EXAMINATION - 2018

Friday, 13<sup>th</sup> April, 2018

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)  $a + 1 = \dots\dots$

- (a) 0 (b) 1 (c) a (d) None

(2) If a and b are elements of Boolean algebra B, then  $a \leq b$  implies .....

- (a)
- $ab = 0$
- (b)
- $ab' > 0$
- (c)
- $aa' = 0$
- (d)
- $ab' = 0$

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

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

(4) Initial approximation of root of an equation by Iteration method can be used for further approximation by .....

- (a) Aitken's
- $\Delta^2$
- process (b) Bisection method (c) False position method (d) None

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

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

(6)  $L[1] = \dots\dots\dots$

- (a) s (b)
- $s^2$
- (c)
- $\frac{1}{s}$
- (d)
- $\frac{1}{s^2}$

(7)  $L[\cosh at] = \dots\dots\dots$

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

(8)  $L[\sin at] = \dots\dots\dots$

- (a)
- $\frac{a}{s^2 - a^2}$
- (b)
- $\frac{1}{s^2 - a^2}$
- (c)
- $\frac{1}{s^2 + a^2}$
- (d)
- $\frac{a}{s^2 + a^2}$

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

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

(10)  $L^{-1}\left[\frac{1}{s^2}\right] = \dots\dots\dots$

- (a) 1 (b)
- $t^2$
- (c) t (d)
- $t^3$

Que.2 Answer the following ( Any Ten )

20

(1) Define : Boolean Algebra and their Properties .

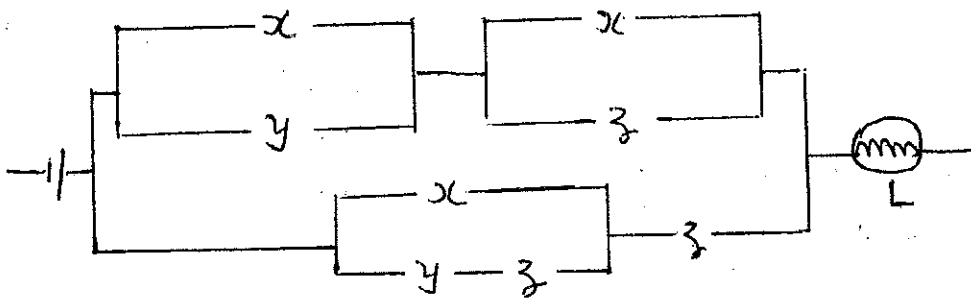
(2) For every element a and b in Boolean algebra B , prove  $a \cdot a = a$  .(3) For every element a and b in Boolean algebra B , prove  $a(a+b) = a$  .

(4) Discuss Newton Raphson Method .

①

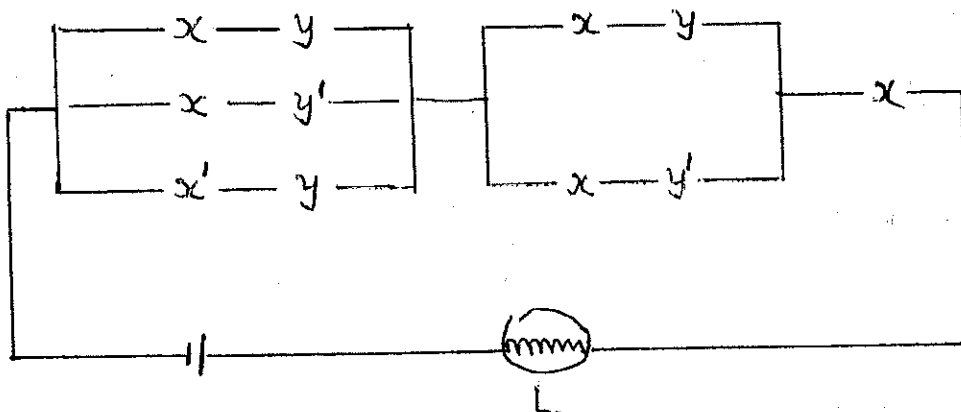
- (5) Find the real root of the equation  $2x = \cos x + 3$ , correct up to 3 decimal places by using Aitken's  $\Delta^2$  Process.
- (6) Define Algebraic and Transcendental Equation with example.
- (7) Evaluate  $L(e^{at})$ .
- (8) Find Laplace transform of  $t \cos at$ .
- (9) Find Laplace transform of  $\sin at$ .
- (10) Find the inverse Laplace transform of  $\frac{s^2 - 3s + 4}{s^3}$ .
- (11) Find the inverse Laplace transform of  $\frac{s + 2}{s^2 - 4s + 13}$ .
- (12) Find the inverse Laplace transform of  $\frac{(5s - 3)}{s^3}$ .

- Que.3 (a) In every Boolean algebra  $B$ , Prove that  $(ab)' = a' + b'$ ,  $\forall a, b \in B$ . 3
- (b) In every Boolean algebra  $B$ , Prove that  $a + (b + c) = (a + b) + c$ ,  $\forall a, b, c \in B$ . 3
- (c) Find the Boolean function of switching circuit given below and simplify it. 4



OR

- Que.3 (d) Prove that in Boolean algebra, every triple of elements  $a, b, c$  satisfies the identity  $ab + bc + ca = (a + b)(b + c)(c + a)$ . 3
- (e) Prove that the element  $a'$  associated with element  $a$  in a Boolean algebra is unique. 3
- (f) Find the Boolean function of switching circuit given below and simplify it. 4



- Que.4 (a) Find cube root of 18 correct up to 3 decimal places , by using Bisection Method. 5  
 (b) 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

OR

- Que.4 (c) Find the real root of the equation  $1 + x^2 = x^3$ , correct up to 3 decimal places by using Iteration Method. 5  
 (d) Find the real root of the equation  $2x = \cos x + 3$  , correct up to 3 decimal places by using Aitken's  $\Delta^2$  Process. 5

- Que.5 (a) Find Laplace transform of  $\sin 2t \sin 3t$  . 3  
 (b) If  $L\{f(t)\} = f(s)$  then prove that  $L\{t^n f(t)\} = (-1)^n \frac{d^n}{ds^n} [f(s)]$  , where  $n = 0, 1, 2, \dots$  3  
 (c) Evaluate  $L \left\{ \int_0^t \frac{e^t \sin t}{t} dt \right\}$  . 4

OR

- Que.5 (d) Find Laplace transform of  $t^2 \sin at$  . 3  
 (e) Find Laplace transform of  $te^{-t} \sin 3t$  . 3  
 (f) Find Laplace transform of  $\frac{\cos at - \cos bt}{t}$  . 4

- Que.6 (a) Find the inverse Laplace transform of  $\frac{2s^2 - 6s + 5}{s^3 - 6s^2 + 11s - 6}$  . 5  
 (b) Apply Convolution Theorem to evaluate  $L^{-1} \left( \frac{s}{(s^2 + a^2)^2} \right)$  . 5

OR

- Que.6 (c) Find the inverse Laplace transform of  $\frac{1}{s(s+1)(s+2)}$  . 5  
 (d) Find the inverse Laplace transform of  $\frac{2s+5}{s^2+4s+13}$  , by using shifting Theorem . 5

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