



PAPER ID-411173

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Subject Code: KAS403

Roll No:

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BTECH
(SEM IV) THEORY EXAMINATION 2023-24
MATHS-III

TIME: 3 HRS

M.MARKS: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief.

2 x 10 = 20

Q no.	Question	Marks	CO
a.	Evaluate Laplace transform of $t \sin t$.	02	1
b.	State shifting theorem of Laplace transform.	02	1
c.	Find Z transform of constant c .	02	2
d.	State Fourier transform.	02	2
e.	Define equivalence relation.	02	3
f.	Define abelian group.	02	3
g.	What is the role of contradiction property?	02	4
h.	Write the condition when a function is invertible.	02	4
i.	Define complemented lattice.	02	5
j.	State idempotent law.	02	5

SECTION B

2. Attempt any three of the following:

3 x 10 = 30

Q no.	Question	Marks	CO
a.	Evaluate $L^{-1}\left(\frac{1}{s(s+1)(s+2)}\right)$.	10	1
b.	Determine the Fourier cosine transform of $\frac{1}{1+x^2}$.	10	2
c.	Show that every cyclic group is abelian.	10	3
d.	Solve the recurrence relation $a_n = 3a_{n-1} + 2$ with condition $a_0 = 1$	10	4
e.	Define CN form. Obtain conjunctive normal form of the following Boolean function: $f(x, y) = (x'y + y'x + y'x')$	10	5

SECTION C

3. Attempt any one part of the following:

1 x 10 = 10

Q no.	Question	Marks	CO
a.	Determine the Laplace transform of a periodic function $f(x) = t/T$, (saw – tooth wave of period T).	10	1
b.	Solve the differential equation $\frac{d^2t}{dx^2} + t = \sin t$, where $x(0) = 1$ and $x(0) = -1$.	10	1

4. Attempt any one part of the following:

1 x 10 = 10

Q no.	Question	Marks	CO
a.	State and prove change of scale property of Fourier transform.	10	2
b.	Discuss the Z transform of $\cos ak$, $k \geq 0$.	10	2



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5. Attempt any one part of the following:**1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Determine the following equivalence: $(p \rightarrow q) \rightarrow t \cong (p \wedge \sim q) \rightarrow t.$	10	3
b.	Show that the structure $\{0, 1, 2, 3, 4\}$ along with operation $+_5$ forms an abelian group.	10	3

6. Attempt any one part of the following:**1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Use principal of mathematical induction to show that $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$	10	4
b.	Among 100 students, 32 study maths, 20 study physics, 45 study biology, 15 study maths and biology, 7 study maths and physics, 10 study physics and biology and 30 do not study any of the three subjects then determine: (i) The number of students studying all three subjects (ii) The number of students studying exactly one of the three subjects	10	4

7. Attempt any one part of the following:**1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Consider the set $D_{30} = \{1, 2, 3, 5, 6, 10, 15, 30\}$ and the relation divides $(/)$ be a partial ordering relation on D_{30} . (a) Draw the Hasse diagram of D_{30} with relation divides. (b) Determine all upper bounds and lower bounds of 5 and 10	10	5
b.	Using k-map, minimize the following Boolean expression $A'B'CD + A'B'CD' + AB'C'D' + AB'CD'$	10	5