



Paper id: 252442

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Subject Code: KAS403

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BTECH
(SEM IV) THEORY EXAMINATION 2024-25
MATHS-III

TIME: 3 HRS

M.MARKS: 100

Note 1: Attempt all Sections. In case of any missing data; choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

Q No.	Question	CO	Level
a.	Evaluate $L(\cosh at)$.	1	K1, K3
b.	State Convolution theorem for Laplace transforms.	1	K1, K3
c.	State Fourier integral theorem.	2	K2, K4
d.	Define change of scale property in Fourier transformation.	2	K2, K4
e.	If $A = (12345)$ and $B = (23)(45)$, find AB .	3	K1, K5
f.	Define proposition and explain logical connectives.	3	K1, K5
g.	Prove that $A \times (B \cap C) = (A \times B) \cap (A \times C)$.	4	K3
h.	Explain Mathematical Induction.	4	K3
i.	Find the complement of given Boolean expression, $xy' + x'z$ and $x(y'z' + yz)$.	5	K3, K6
j.	Define partially ordered sets and give examples.	5	K3, K6

SECTION B**2. Attempt any three of the following:****10 x 3 = 30**

a.	Draw the Hasse diagram for the poset $(P(S), \subseteq)$ where $P(S)$ is the power set on $S = \{1,2,3\}$.	5	K3, K6
b.	State and prove Lagrange's theorem.	3	K1, K5
c.	Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, $0 < x < 4, t > 0$ subject to condition $u(0, t) = 0, u(4, 0) = 0, u(x, 0) = 2x$.	2	K2, K4
d.	Show that $\frac{1}{1.2} + \frac{1}{2.3} + \dots + \frac{1}{n(n+1)} = \frac{n}{n+1}$ by mathematical induction.	4	K4
e.	Find Laplace transformation of $\frac{1-\cos t}{t^2}$.	1	K1, K3

SECTION C**3. Attempt any one part of the following:****10 x 1 = 10**

a.	Prove that the complete disjunctive normal form and complete conjunctive normal form in three variables in a Boolean algebra is equal to the unit and zero element, respectively, of the Boolean algebra.	5	K3, K6
b.	Show that D_{30} is a finite Boolean algebra under partial order divisibility.	5	K3, K6



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

a.	Given R and S are equivalence relations on the set A . Prove that (i) R^{-1} is an equivalence relation, (ii) $R \cap S$ is an equivalence relation.	4	K3
b.	State Pigeonhole principle. Give its real word applications. Discuss the probabilistic interpretation of the Pigeonhole principle.	4	K3

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

a.	Find the Inverse Laplace transformation of $\frac{1}{s^4+4}$.	1	K1, K3
b.	Find Laplace transformation of $f(t) = \begin{cases} t^2, & 0 < t < 2 \\ t - 1, & 2 < t < 3 \\ 7, & t > 3 \end{cases}$	1	K1, K3

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

a.	Find the Z-transformation: $\left(\frac{1}{2}\right)^{ K }$	2	K2, K4
b.	Find the function whose sine transformation is $\frac{e^{-as}}{s}$.	2	K2, K4

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

a.	Define ring. Show that $(Z, +, \cdot)$ is a commutative ring.	3	K1, K5
b.	Prove that following equivalences: (i) $(p \rightarrow q) \rightarrow q \equiv p \vee q$ (ii) $p \rightarrow (q \vee r) \equiv (p \rightarrow q) \vee (p \rightarrow r)$	3	K1, K5