Printed Page: 1 of 1
Subject Code: KAS203

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM II) THEORY EXAMINATION 2021-22
BASIC MATHEMATICS II

Time: 3 Hours *Total Marks: 100*

Notes:

- *Attempt all Sections and Assume any missing data.*
- *Appropriate marks are allotted to each question, answer accordingly.*

SECTION-A	Attempt All of the following Questions in brief (10X2=20)	CO	BL
Q1(a)	State Cayley Hamilton theorem and verify for the matrix $A = \begin{bmatrix} 1 & -1 \\ -2 & 2 \end{bmatrix}$	CO1	KL1
Q1(b)	If $A = \begin{bmatrix} 1-i & 2i \\ 3+5i & 5 \end{bmatrix}$, find the transposed conjugate of A.	CO1	KL3
Q1(c)	Show that the function $u = \frac{1}{2}\log(x^2 + y^2)$ is harmonic.	CO2	KL3
Q1(d)	Show that the function $f(z) = \|z\|^2$ where $z = x + iy$ is analytic only at origin.	CO2	KL3
Q1(e)	Find the curl and divergent of the vector function $\vec{F} = xy\hat{i} + y^2z\hat{j} - xz^2\hat{k}$ at point $(1, -1, 0)$.	CO3	KL3
Q1(f)	Find the unit normal vector to the surface $x^2 = z^2 + y^2$ at the point (2,1,1).	CO3	KL3
Q1(g)	Write the Dirichle's conditions for a Fourier series.	CO4	KL1
Q1(h)	Find the partial differential equation of the equation $z = f(x^2 - y^2)$.	CO4	KL3
Q1(i)	Classify the partial differential equation $x^2r - 2xys + y^2t = \frac{y^2}{x}p + \frac{x^2}{y}q$.	CO5	KL4
Q1(j)	Write two dimensional heat flow equations for steady state and transient state.	CO5	KL1

SECTION-B	Attempt ANY THREE of the following Questions (3X10=30)	CO	BL
Q2(a)	Show that the equations $-2x + y + z = a$ $x - 2y + z = b$ $x + y - 2z = c$ Have no solution unless $a + b + c = 0$. In which case they have infinitely many solutions? Find these solutions when $a = 1, b = 1$ and $c = -2$.	CO1	KL3
Q2(b)	Show that the function $f(z)$ defined by $f(z) = \begin{cases} \frac{x^3y^5(x+iy)}{x^6+y^{10}}, & z \neq 0 \\ 0, & z = 0 \end{cases}$ is not analytic at the origin even though it satisfies Cauchy Riemann equations at the origin.	CO2	KL3
Q2(c)	If a vector field is given by $\vec{F} = (x^2 - y^2 + x)\hat{i} - (2xy + y)\hat{j}$. Is this field irrotational? If so, find its scalar potential.	CO3	KL3
Q2(d)	Find the Fourier series of the function $f(x) = \begin{cases} -x, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$	CO4	KL3
Q2(e)	A rectangular plate with insulated surfaces is 8 cm wide and so long compared to its width that it may be considered infinite in length without introducing an appreciable error. If the temperature along one short edge $y = 0$ is given by $u(x, 0) = 100 \sin\frac{\pi x}{8}$, $0 < x < 8$, while the two long edges $x = 0$ and $x = 8$ as well as the other short edge are kept at $0°$ C, show that the steady state temperature at any point of the plate is given by $u(x, y) = 100e^{-\frac{\pi y}{8}} \sin\frac{\pi x}{8}$.	CO5	KL3