PAPER ID-311288

Subject Code: KAS103T

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

B.TECH
(SEM I) THEORY EXAMINATION 2020-21
ENGINEERING MATHEMATICS-I

Time: 3 Hours *Total 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**

Qno.	Question	Marks	CO
a.	Prove that the matrix $\frac{1}{\sqrt{}}$ 1 1 i 1 i 1 is unitary.	2	1
b.	State Rank-Nullity Theorem.	2	1
c.	State Rolle's Theorem.	2	2
d.	Discuss all the symmetry of the curve $x\,y$ x a	2	2
e.	If u $f\,y$ z, z x, x y , prove that — — — 0	2	3
f.	If x $e\,sec\,u, y$ $e\,tan\,u$, then evaluate —.	2	3
g.	Evaluate e $dydx$.	2	4
h.	Calculate the volume of the solid bounded by the surface x = 0, y =0, x+y+z=1 and z=0.	2	4
i.	Show that the vector $\vec{V}$ $x\ 3y\,\hat{i}$ $y\ 3z\,\hat{j}$ $x\ 2z\ k$ is solenoidal.	2	5
j.	State Green's theorem.	2	5

SECTION B

2. Attempt any *three* of the following:

Qno.	Question	Marks	CO
a.	Find the inverse of the matrix A $2\ 3\ 4$ $4\ 3\ 1$ $1\ 2\ 4$	10	1
b.	If y e , prove that. $(1 + x^2)y_{n+2} + [(2n+2)\,x-1)\,y_{n+1} + n\,(n+1)\,y_n = 0$.	10	2
c.	If u v w x y z, $u\ v$ w x y z, $u\ v\ w$ x y z ,Show that: $\frac{\partial\,u, v, w}{\partial\,x, y, z}$ $\frac{1\ 4xy\ xy\ yz\ zx\ 16xyz}{2\ 3\,u\ v\ w\ 27u\,v\,w}$	10	3
d.	Evaluate by changing the variables $\iint$ $x\ y$ $dx\,dy$ where R is the region bounded by the parallelogram x+y=0, x+y =2, 3x-2y=0 and 3x-2y = 3.	10	4
e.	Use divergence theorem to evaluate the surface integral $\iint$ $xdydz$ $ydzdx$ $zdxdy$ where S is the portion of the plane x+2y+3z=6 which lies in the first octant.	10	5

SECTION C

3. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Find non-singular matrices P and Q such that PAQ is normal form. $\begin{matrix}1 & 1 & 2\\ 1 & 2 & 3\\ 0 & 1 & 1\end{matrix}$	10	1
b.	Find the eigen values and the corresponding eigen vectors of the following matrix. $A = \begin{matrix}2 & 0 & 1\\ 0 & 3 & 0\\ 1 & 0 & 2\end{matrix}$.	10	1

4. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Find the envelope of the family of lines $\frac{x}{a} + \frac{y}{b} = 1$, where a and b are connected by the relation $a + b = c$	10	2
b.	If $y = \sin(m \sin^{-1}x)$, find the value of y_n at $x = 0$.	10	2

5. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Divide 24 into three parts such that continued product of first,square of second and cube of third is a maximum.	10	3
b.	If $u = \sec^{-1}\frac{x^3+y^3}{x+y}$,prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2\cot u$. Also evaluate $x\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y\frac{\partial^2 u}{\partial y^2}$.	10	3

6. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Evaluate the following integral by changing the order of integration $\int_0^1 \int_{x^2}^{x} dy dx$.	10	4
b.	A triangular thin plate with vertices (0,0),(2,0) and (2,4) has density $\rho = 1 + x + y$. Then find: (i) The mass of the plate. (ii) The position of its centre of gravity G.	10	4

7. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	A fluid motion is given by $\vec{v} = (y\sin z + \sin x)\hat{i} + (x\sin z + 2yz)\hat{j} + (xy\cos z + y)\hat{k}$.Is the motion irrotational? If so, find the velocity potential.	10	5
b.	Verify Stoke's theorem for the function $\vec{F} = x\hat{i} + xy\hat{j}$ integrated round the square whose sides are x=0,y=0,x=a,y=a in the plane z=0.	10	5