SRN

PES University, Bengaluru

(Established under Karnataka Act No. 16 of 2013)

UE20MA151

MAY 2022: END SEMESTER ASSESSMENT (ESA) B TECH _II__ SEMESTER

UE20MA151 – ENGINEERING MATHEMATICS - II

Time: 3 Hrs	Answer All Questions	Max Marks: 100

1	a)	Evaluate $\int_0^1 \int_0^{\sqrt{1+x^2}} \frac{dy\,dx}{(1+x^2+y^2)}$. Draw the region of integration.	6
	b)	Evaluate by polar form the double integral $\int\int_R e^{x^2}\,dx\,dy$ where R is the triangular region bounded by the lines $= 0\,, x = 2\ and\ x = 2y$.	7
	c)	Evaluate $\int\int\int_V x\,y\,z\,(x^2+y^2+z^2)^{\frac{n}{2}}\,dx\,dy\,dz$ where V is the volume bounded by the positive octant of the sphere $x^2+y^2+z^2=b^2$ given that $(n+2)>0$.	7
2	a)	Evaluate $\int_C \vec{F}.\overrightarrow{dr}$ given that $\vec{F} = z\hat{\imath} + x\hat{\jmath} + y\hat{k}$ and C is the arc of the curve $\vec{r} = \cos(t)\,\hat{\imath} + \sin(t)\,\hat{\jmath} + t\,\hat{k}$ from $t = 0$ to $= 2\pi$.	6
	b)	Let D by the region bounded by the closed cylinder $x^2+y^2=16\,, z=0\ and\ z=4$. If $\vec{F} = 3x^2\hat{\imath} + 6y^2\hat{\jmath} + z\hat{k}$, then evaluate $\int\int_S \vec{F}.\,\hat{n}\,dS$ using Gauss-Divergence theorem.	7
	c)	Use Green's theorem to find the area enclosed by the parabolas $x^2 = 4y$ and $y^2 = 4x$.	7
3	a)	Find the Laplace transform of $\frac{cos2t-cos3t}{t}$	6
	b)	Find the Laplace transform of the periodic function $f(t) = \begin{cases} \sin\omega t & 0 < t \le \frac{\pi}{\omega} \\ 0 & \frac{\pi}{\omega} < t < \frac{2\pi}{\omega} \end{cases}$ with period $\frac{2\pi}{\omega}$.	7
	c)	Evaluate $L[t^3 \cos t]$	7
4	a)	Find $L^{-1}\left[\ln\left(\frac{s+1}{s-1}\right)\right]$	6
	b)	Find $L^{-1}\left[\frac{1}{s^2(s^2+a^2)}\right]$ using Convolution theorem.	7
	c)	Solve the equation for the response $i(t)$ given that, $\frac{di}{dt} + 2i + 5\int_0^t i\,dt = u(t)$ and $(0) = 0$.	7
5	a)	Obtain the constant term and the coefficients of the first harmonic in the Fourier expansion of y as given in the following table:	6

x	0	1	2	3	4	5
y	9	18	24	28	26	20

	b)	Obtain the half range cosine series for the function $(x) = x^2\ in\ (0, \pi)$.	7
	c)	Find the complex form of the Fourier series $f(x) = e^{-x}$ in $-1 \le\ x \le 1$.	7