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PES UNIVERSITY

PES University, Bangalore

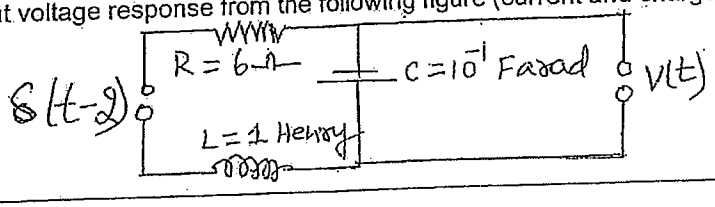
(Established under Karnataka Act No. 16 of 2013)

UE16MA151

MAY 2017: END SEMESTER ASSESSMENT (ESA) B.TECH. II SEMESTER

UE16MA151- ENGINEERING MATHEMATICS-II

Time: 3 Hrs | Answer All Questions | Max Marks: 100

1.	a)	i) Find the angle between the surfaces $x^2+y^2+z^2=9$ and $z=x^2+y^2-3$ at the point $(2,-1,2)$. ii) Find the magnitude of the velocity of a particle which moves along the curve $x=2\sin 3t,\ y=2\cos 3t,\ z=8t$ at any time $t>0$.	3 +3
	b)	Evaluate $\int_C 3y\,dx+4z\,dy+6y\,dz$ where C is the curve of intersection of the sphere $x^2+y^2+z^2=8Z$ and $Z=x+4$.	7
	c)	Verify the divergence theorem for the vector field $\vec{F}=x\hat{i}+y\hat{j}+z\hat{k}$ over the sphere of radius "a" centered at the origin.	7
2.	a)	With usual notations, derive the relation between Beta and Gamma functions.	6
	b)	Using Beta and Gamma functions prove that $\int_{-\infty}^{\infty}\frac{e^{2x}}{a e^{3x}+b}dx=\frac{2\pi}{3\sqrt{3}\,a^{2/3}b^{1/3}}$,where $a,b>0$.	7
	c)	Prove that $\int_0^1 x J_n(\alpha x)J_n(\beta x)\,dx=0\ (\alpha\neq\beta)$ where α,β are the roots of $J_n(x)=0$	7
3.	a)	Find the Laplace transform of $t^2 e^{-2t}\sin 3t+\frac{e^{-2t}\sin t}{t}+t^3\delta(t-1)$.	6
	b)	Find the Laplace transform of $f(t)=\lvert t-1\rvert+\lvert t+1\rvert,\ t\geq 0$.	7
	c)	Find the Laplace transform of f(t) by expressing it in terms of Unit step function , $f(t)=\begin{cases}\sin t & t\leq\pi\\ 1 & \pi<t\leq 2\pi\\ \cos t & t>2\pi\end{cases}$	7
4.	a)	Find the inverse Laplace transform of $\frac{3s^2+16s+25}{s^2\left(s^2+8s+25\right)^2}$ as a definite integral of function of 't' (without using Partial fractions).	6
	b)	Apply Convolution theorem to evaluate inverse Laplace transform of $\frac{s(s+1)}{\left(s^2+1\right)\left(s^2+2s+2\right)}$	7
	c)	Find, out put voltage response from the following figure (current and charge are zero at t = 0). 	7

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5.	a)	Find Fourier series expansion for the function $f(x)$ in the interval $(-\pi,\pi)$ where $f(x)=\begin{cases}0 & -\pi<x\le 0\\ \frac{\pi x}{4} & 0<x<\pi\end{cases}$	6
	b)	Prove that in $0<x<2$, $x=1-\frac{8}{\pi^2}\left[\cos\left(\frac{\pi x}{2}\right)+\frac{1}{3^2}\cos\left(\frac{3\pi x}{2}\right)+\frac{1}{5^2}\cos\left(\frac{5\pi x}{2}\right)+\ldots\ldots\right]$ and hence deduce that $\frac{1}{1^4}+\frac{1}{3^4}+\frac{1}{5^4}+\ldots\ldots=\frac{\pi^4}{96}$	7
	c)	Determine the constant term and the coefficients of $\sin\theta$ and $\sin 2\theta$ in the Fourier series expansion of the following tabulated function	7

θ^0	0	60	120	180	240	300
y	0	9·2	14·4	17·8	17·3	11·7