SRN

PES University, Bangalore

(Established under Karnataka Act No. 16 of 2013)

UE17MA151

END SEMESTER ASSESSMENT B.TECH. II SEMESTER - December 2018

UE17MA151- ENGINEERING MATHEMATICS-II

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

1.	a)	Find $L\left[\frac{\cos\sqrt{t}}{\sqrt{t}}\right]$ (ii) $L\left[e^{-t}\cos^2 t\right]$.	7
	b)	Express the following in terms of unit step function and hence find the Laplace transforms, $f(t)=\begin{cases}\sin t & 0\le t<\pi \\ \sin 2t & \pi\le t<2\pi \\ \sin 3t & t\ge 2\pi\end{cases}$.	7
	c)	If $f(t)$ is a periodic function with period T, show that $L[f(t)]=\frac{1}{1-e^{-sT}}\int_0^T e^{-st} f(t)\,dt$.	6
2.	a)	Find the Laplace inverse of $\frac{s}{s^4+4a^4}$.	7
	b)	Find $L^{-1}\left[s\log\left(\frac{s+4}{s-4}\right)\right]$.	7
	c)	Using Laplace transform method, solve the initial value problem $y''+3y'-10y=4\delta(t-2);\ y(0)=2,\ y'(0)=-3$.	6
3.	a)	If α and β are the roots of $J_n(ax)=0$, then show that $\int_0^a xJ_n(\alpha x)J_n(\beta x)dx=\begin{cases}0 & \text{if } \alpha\ne\beta \\ \frac{a^2}{2}[J_{n+1}(\alpha a)]^2 & \text{if } \alpha=\beta\end{cases}$.	9
	b)	Express $\int_0^1\sqrt{-\log x}\,dx$ in terms of beta function and hence evaluate.	5
	c)	Derive the relation between beta and gamma functions.	6
4.	a)	Find constants a and b such that $\vec{F}=\left(axy+z^3\right)\hat{i}+\left(3x^2-z\right)\hat{j}+\left(bxz^2-y\right)\hat{k}$ is irrotational. Also find a scalar function ϕ such that $\vec{F}=\nabla\phi$.	7
	b)	A surface S consists of that part of the cylinder $x^2+y^2=9$ between $z=0$ and $z=4$ for $y\ge 0$ and the two semi-circles of radius 3 in the planes $z=0$ and $z=4$. Verify Stokes theorem where $\vec{F}=z\hat{i}+xy\hat{j}+xz\hat{k}$.	7
	c)	If V is the region in first octant bounded by $y^2+z^2=9$, and plane $x=z$ and $\vec{F}=2x^2y\hat{i}-y^2\hat{j}+4xz^2\hat{k}$, then evaluate $\iiint_V \nabla\cdot\vec{F}\,dV$.	6

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5.	a)	Find the Fourier series for the function $f(x)=\begin{cases}1+2x & -3\le x\le 0\\ 1-2x & 0\le x\le 3\end{cases}$ and hence deduce that $\sum_{n=1}^{\infty}\frac{1}{(2n-1)^2}=\frac{\pi^2}{8}$.	7
	b)	Obtain Fourier series till the second harmonics given in the following table	7
	c)	Prove that in the interval $0<x<2$, $x=1-\frac{8}{\pi^2}\left\{\cos\frac{\pi x}{2}+\frac{1}{3^2}\cos\frac{3\pi x}{2}+\frac{1}{5^2}\cos\frac{5\pi x}{2}+----\right\}$. Deduce that $\frac{1}{1^4}+\frac{1}{3^4}+\frac{1}{5^4}+----=\frac{\pi^4}{96}$. Hence determine the sum S of the series $\frac{1}{1^4}+\frac{1}{2^4}+\frac{1}{3^4}+----$.	6

x^0	45	90	135	180	225	270	315	360
$f(x)$	4.0	3.8	2.4	2.0	-1.5	0	2.8	3.4