Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

II SEMESTER B.TECH.

END SEMESTER EXAMINATIONS, April 2019

SUBJECT: ENGINEERING MATHEMATICS-II [MAT 1251]

REVISED CREDIT SYSTEM

Time: 3 Hours Date: 23-04-2019 MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.

1A.	a) Evaluate $\lim_{x\to 0}\left(\frac{\text{Sin x}}{x}\right)^{1/x^2}$ b) Evaluate $\lim_{x\to 0}\left(\frac{1}{x}-\frac{1}{e^x-1}\right)$	**4**
1B.	If $f(x)=\sin^{-1}x, 0<a<b<1$, then use mean value theorem to prove $\frac{b-a}{\sqrt{1-a^2}}<\sin^{-1}b-\sin^{-1}a<\frac{b-a}{\sqrt{1-b^2}}$.	**3**
1C.	If $u=\sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, then show that $x^2\frac{\partial^2 u}{\partial x^2}+2xy\frac{\partial^2 u}{\partial x\partial y}+y^2\frac{\partial^2 u}{\partial y^2}=\tan^3 u$.	**3**
2A.	Expand $f(x,y)=e^x\sin y$ about the point $\left(0,\frac{\pi}{2}\right)$ up to third degree terms.	**4**
2B.	Find the maximum and minimum distance from the point $(1,2,3)$ to the sphere $x^2+y^2+z^2=36$.	**3**
2C.	Find the equation of the sphere which passes through the circle $x^2+y^2+z^2-2x-3y+4z+8=0, x-2y+z-8=0$ and has the center on the plane $4x-5y-z-3=0$.	**3**

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3A.	Test the convergence of the following series a) $\frac{4}{18}+\frac{4\cdot12}{18\cdot27}+\frac{4\cdot12\cdot20}{18\cdot27.36}+\cdots\infty$ b) $\sum_{n=1}^{\infty} ne^{-n^2}$	**4**
3B.	Evaluate $\int_0^{\pi/2}(\sqrt{tan\theta}-\sqrt{sec\theta})d\theta$	**3**
3C.	Find the area bounded by the curves $r=a(1+cos\theta)$ and $r=a\,(1-cos\theta)$.	**3**
4A.	a) Find $L\left[\frac{e^t\sin t}{t}\right]$ b) Find $L^{-1}\left[\frac{s^2+s-2}{s(s+3)(s-2)}\right]$	**4**
4B.	Solve $y''-3y'+2y=1-e^{-2t}$ using Laplace transforms. Given that $y(0)=y'(0)=1$.	**3**
4C.	Draw the graph of the Periodic function $f(t)=\begin{cases} t & ;\ 0<t<\pi \\ \pi-t & ;\pi<t<2\pi \end{cases}$ and find its Laplace transform.	**3**
5A.	Obtain the region of convergence for the series $\sum\frac{x^n}{(2n-1)^2 2^n}$.	**4**
5B	Evaluate $\int_0^1\int_x^{\sqrt{2-x^2}}\frac{x}{\sqrt{x^2+y^2}}\,dy\,dx$ by changing the order of integration.	**3**
5C.	Using triple integration, find the volume of the paraboloid $x^2+y^2=4z$ cut off by the plane $z=4$.	**3**