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PES University, Bangalore

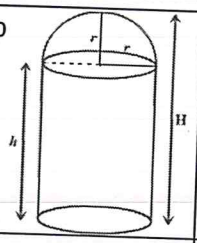
(Established under Karnataka Act No. 16 of 2013)

UE18MA101

END SEMESTER ASSESSMENT (ESA),B.TECH. I- SEMESTER- Dec. 2018

UE18MA101- ENGINEERING MATHEMATICS-I

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

1.	a)	Verify Cauchy's Mean value theorem for the function $f(x)=\sin x$, $g(x)=\cos x$ in the interval $[\pi/6, \pi/3]$.	4
	b)	Show that the two curves $r=a$, $r=a(1+\cos\theta)$ intersects at an angle $\pi/4$.	4
	c)	Show that for the curve $r=f(\theta)$, the curvature is given by $\left[\frac{d^2u}{d\theta^2}+u\right]\sin^3\phi$, where $u=\frac{1}{r}$.	7
	d)	Find the nth derivative of $\frac{1}{2}e^{3x}\cos x\sin^2 x$.	5
2.	a)	If $x=e^u \tan v$, $y=e^u \sec v$, $z=e^{-2u}f(v)$, Prove that $xz_x+yz_y+2z=0$	6
	b)	A hot water storage thank is a vertical cylinder surmounted by a hemispherical top of the same diameter. The tank is designed to hold 400 m^3 of liquid. Determine the total height **H** and the diameter **2r** of the tank if the surface heat loss is to be a minimum. 	7
	c)	Expand $e^x \cos y$ in powers of (x-1) and $(y-\pi/4)$ using Taylor's series up to the third degree term.	7
3.	a)	Trace the curve $(x^2+y^2)x=2ay^2$.	6
	b)	Evaluate $\iiint_E x\,dv$, where E is the region enclosed by $z=0$, $z=x+y+5$, $x^2+y^2=4$ and $x^2+y^2=9$.	7
	c)	Evaluate $\int_0^{a/\sqrt{2}} \int_y^{\sqrt{(a^2-y^2)}} \log(x^2+y^2)\,dx\,dy$ by changing the order of integration.	7
4.	a)	Find the Orthogonal trajectories for the family of curves $r=\frac{2a}{1+\cos\theta}$	6
	b)	Solve $x-yp=ap^2$, using the method of equation solvable for y.	7
	c)	Solve $\frac{dy}{dx}=1+\frac{y}{x}+\frac{y^2}{x^2}$	7
5.	a)	Solve $(D^4+D^2+1)y=ax^2+b\sin 2x$	6
	b)	Solve $(5+2x)^2 y''-6(5+2x)y'+8y=6x$.	7
	c)	Solve $(x^2D^2+xD-1)y=x^2e^x$ by the method of variation of parameters. (Reduce the given differential equation to a differential equation with constant coefficient first)	7