SRN

PES UNIVERSITY, BANGALORE-85

(Established under Karnataka Act 16 of 2013)

UE16 UE15MA101

END SEMESTER ASSESSMENT (ESA), B.TECH. I-SEMESTER - DECEMBER-2020

UE15MA101-ENGINEERING MATHEMATICS-I

(Common for All Branches)

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

1.	a)	If $y = e^{mcos^{-1}x}$, show that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+m^2)y_n = 0$.	7
	b)	Find the radius of the curvature of the curve $r = a(1-cos\theta)$ at any point.	7
	c)	Verify Cauchy's mean value theorem for the function $f(x) = log_e x$ and $g(x) = \frac{1}{x}$ in the interval $[1, e]$	6
2.	a)	Use Euler's theorem for a homogeneous function to find the value of $xu_x + yu_y + zu_z$ given $u = sin^{-1}\left(\frac{x^3+y^3+z^3}{ax+by+cz}\right)$.	5
	b)	Find $u_x, u_y, u_{xx}, u_{xy}, u_{yy}$ for $u = x^4 + y^3 + x^3y + xy^3$.	4
	c)	Use Maclaurin's series to expand $\log(1+x)$ upto the term containing x^4.	6
	d)	Obtain the reduction formula for $cos^n x$.	5
3.	a)	Trace the curve $y^2(a-x) = x^3$, $a > 0$.	7
	b)	Calculate the volume of the solid bounded by the planes $x = 0, y = 0,$ $x + y + z = a$ and $z = 0$.	7
	c)	Evaluate $\int_0^5 \int_0^{x^2} x(x^2+y^2)dx\,dy$.	6
4.	a)	Solve the differential equation $\frac{dy}{dx} + ycotx = 4xcosecx$ given $y = 0$ when $x = \frac{\pi}{2}$.	7
	b)	Solve $(ylogy)dx + (x - logy)dy = 0$.	7
	c)	Find the orthogonal trajectories of $r^n = asinn\theta$.	6
5.	a)	Find the complimentary function and particular integral of $(D-2)^2 = 8(e^{2x} + sin2x + x^2)$.	7
	b)	Solve $\frac{d^2y}{dx^2} + 4y = tan2x$ by the method of variation of parameters.	7
	c)	Solve $x^2\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} + y = \frac{1}{(1-x)^2}$.	6