KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Ag. Engg) 2018 Admission
I Semester Final Examination-January 2019

Sacs.1101 **Engineering Mathematics I (2+1)**

Marks:50
Time:2hours

I Fill in the blanks: **(10x1=10)**

1. Find the asymptote to the curve $y^2(a+x)=x^2(b-x)$, parallel to y axis.
2. State Euler's theorem on homogeneous functions.
3. If $x^3 + y^3 - 3axy = 0$ find $\frac{dy}{dx}$
4. Find a differential Equation representing the family of curves $y = Ae^x$
5. Find the general solution of the differential Equation $(D^2 - 3D + 2)\, y = 0$ where $D = \frac{d}{dx}$
6. What is the general form of a Cauchy's Linear Differential Equation and write the transformation needed to convert it in to a linear differential equation with constant coefficients.
7. Find the unit vector normal to the surface $x^2 + y^2 + z^2 = a^2$ at (x,y,z).
8. Define Curl of a vector valued function.
9. Calculate $\nabla^2 f$ where $f = 4x^2 + 9y^2 + z^2$
10. State the formula in Green's theorem.

II Write Short notes on ANY FIVE of the following **(5x2=10)**

1. What is the maximum value of the function $y = x(1-x)^2$ in the interval (0,1)
2. Find the Taylor series expansion of the function $y = Sin\, x$ about x=0
3. Solve $x\frac{dy}{dx} + y = xy^3$
4. Solve $y = p\sin p + \cos p$
5. Solve $\frac{d^2y}{d^2x} - 12\frac{dy}{dx} + 36y = e^{6x}$
6. Evaluate $\int_C \vec{F}.d\vec{r}$ along the parabola $y^2 = x$ between the points (0,0) and (1,1) where $\vec{F} = x^2\vec{i} + xy\vec{j}$
7. Use Gauss divergence theorem to evaluate $\iint_S (yz\,\vec{i} + zx\,\vec{j} + xy\,\vec{k}).dS$ where S is the surface of the sphere in the first octant.

P.T.O

III **Answer ANY FIVE of the following** **(5x4=20)**

1 Prove that $\lim_{x\to 0} \sin x \log x = 0$

2 If $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$ prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \tan u$

3 Solve by the method of variation parameters, $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x \log x$

4 Solve $\frac{dx}{dt} - 7x + y = 0\, ; \frac{dy}{dt} - 2x - 5y = 0$

5 Prove that $J_{\frac{5}{2}}(x) = \sqrt{\frac{2}{\pi x}}\left\{\frac{3-x^2}{x^2}\sin x - \frac{3}{x}\cos x\right\}$

6 Find $CurlCurl\ \vec{A}$ where $\vec{A} = x^2yi - 2xzj + 2yzk$ at the point (1,0,2)

7 Evaluate by Stoke's theorem $\oint_C (e^x dx + 2ydy - dz)$ where C is the curve $x^2 + y^2 = 4, z = 2$

IV **Answer ANY ONE of the following** **(1x10=10)**

1 Evaluate $\iiint x^2 yzdxdydz$ over the region bounded by the planes $x=0, y=0, z=0, x+y+z=1$

2\. (a) If $\vec{A} = x^2z\vec{i} - 2y^3z^2\vec{j} + xy^2z\vec{k}$ find $\nabla . \vec{A}$ at the point (1,-1,1)

(b) Solve $(D^2 - 2D + 2)y = e^x x^3$

****