Sacs.1101

B.Tech. (Ag. Engg.) 2017 Admission
I Semester Final Examination-January-2018

Engineering Mathematics I (2+1)

Marks: 50
Time: 2 hours

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

1 $\lim_{x\to 0} \frac{a^x-1}{x}$ is .....

2 If $f(x,y) = xy^2 - cosy$, then the value of the partial derivative $\frac{\partial f}{\partial x}$ is.....

3 The degree of the homogeneous function $f(x,y) = \frac{x^4+y^4}{x+y}$ is .....

4 If two functions are functionally dependent then their Jacobian is .....

5 $\iint_R dx\,dy$ represent ..... of the region R.

6 The degree of the differential equation $\frac{d^2y}{dx^2} - 3\left(\frac{dy}{dx}\right)^2 + y = 0$ is .....

7 The solution of the differential equation $(D^2 - 4)y = 0$ is .....

8 The Particular integral of the differential equation $(D + 5)y = e^{2x}$ is .....

9 If $\varphi(x,y,z) = x^2 + y^2 + z^2$, then the gradient $\nabla\varphi$ is .....

10 If $\boldsymbol{F}$ is a vector field with curl $\boldsymbol{F} = 0$, then the vector $\boldsymbol{F}$ is said to be .....

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

1 Find the Maclaurin's series of $f(x) = e^x$

2 If $u = x^2 - y,\ v = x + y$, then find the Jacobian of u and v with respect to x and y.

3 Show that $(x^2 - 4xy - 2y^2)dx + (y^2 - 4xy - 2x^2)dy$ is an exact differential equation.

4 If $u = x^2 + y^2$, with $x = a\,cost, y = b\,sint$ find $\frac{du}{dt}$.

5 Evaluate $\int_0^1 \int_0^2 (x + 3)\,dx\,dy$

6 State Stoke's Theorem.

7 If $\vec{r} = x\hat{\imath} + y\,\hat{\jmath} + z\hat{k}$, then evaluate div $\vec{r}$.

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

1 If $u = e^{x^3+y^3}$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 3u\log u$

2 Find the maxima and minima of $x^3 + y^3 + 3xy$.

3 Change the order of integration and hence evaluate $\int_0^1 \int_x^1 \frac{x}{x^2+y^2}\,dydx$

PTO

Use triple integrals to find the volume bounded by the cylinder $x^2 + y^2 = 9$, the planes $z = 1$ and $x + z = 5$.

5 Solve the Bernoulli's differential equation: $x\frac{dy}{dx} + y = xy^3$.

6 Solve $\frac{d^2y}{dx^2} + y = cosec\ x$ using the method of variation of parameters.

7 Use Green's Theorem to evaluate $\oint_C (x - 2y)dx + (3x - y)dy$, where C is the boundary of a unit square

IV **Write an essay on any one of the following** **(1x10=10**

1 Solve the Legendre's linear equation:

$$(3x + 2)^2 \frac{d^2y}{dx^2} + 3(3x + 2)\frac{dy}{dx} - 36y = 3x^2 + 4x + 1$$

2 Verify Gauss divergence theorem for $\vec{F} = (x + y)\hat{\imath} + x\hat{\jmath} + x\hat{k}$ taken over the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$.

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