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INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(MAHE)

III-SEMESTER B.Sc. (Applied Sciences) DEGREE EXAMINATION – NOV/DEC 2021

SUBJECT: MATHEMATCS-III (IMA 231)

(BRANCH: CHEMICAL/CS)

Time: 3 Hours **17 November 2021** **Max. Marks: 100**

- ✓ **Answer ANY FIVE FULL Questions.**
- ✓ **Missing data, if any, may be suitably assumed**

1.

a. Solve $y(1+x^2)^{\frac{1}{2}}dy + x\sqrt{1+y^2}\,dx = 0$

b. Solve $\dfrac{dy}{dx} - \dfrac{y}{x} + \operatorname{cosec}\dfrac{y}{x} = 0,\quad y(1)=0$

c. Solve $(4r^2s-6)dr + r^3ds = 0$ **(7+6+7)**

2.

a. Solve $(D^3-3D^2+4D-2)y = e^x + \cos x$

b. Solve $(ye^{xy}+4y^3)dx + (xe^{xy}+12xy^2-2y)dy = 0,\ \ y(0)=2$

c. Solve $(D^2+1)y = \operatorname{cosec} x$ by method of variation of parameters. **(7+6+7)**

3.

a. Applying Taylor's series method, find the value of y(1.1) correct to four decimal places given that $\dfrac{dy}{dx} = xy^{1/3}, y(1)=1$

b. Solve by the method of indicated transform $u_{xx}+u_{xy}-2u_{yy}=0$ by using the transformation $v=x+y$ and $z=2x-y$.

c. Solve D.E by Laplace Transform $y''+4y'+8y=1$
$y(0)=0, y'(0)=1.$ **(6+7+7)**

4.

a. Solve by Partial fraction $F(S) = \dfrac{s^3-3s^2+6s-4}{(s^2-2s+2)^2}$

b. Find the Laplace transform of a periodic function $f(t) = \begin{cases} \dfrac{t}{a}, 0<t<a \\ \dfrac{1}{a}(2a-t), a<t<2a \end{cases}$

with f(t) = f(t+2a) and sketch the graph.

c. Solve by the method separation of variables $4\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}=3u$ given $u(0,y)=2e^{5y}$. **(7+6+7)**

5.

a. Find Laplace transform of saw-toothed wave of period T given $f(t)=\frac{K}{T}t$.

b. Find $L^{-1}\left\{\frac{2s-5}{4s^2+25}+\frac{4s-18}{9-s^2}\right\}$

c. Solve $(D^2+1)x=t\cos 2t$ given $x=0, \frac{dx}{dt}=0, at \quad t=0$. **(6+7+7)**

6.

a. Show that $f(z)=\cosh z$ is analytic and hence find $f^{I}(z)$.

b. Show that the following function is harmonic also determine the corresponding analytic function $f(z)$ and find its conjugate $u=\sin x\cosh y+2\cos x\sinh y+x^2-y^2+4xy$.

c. Evaluate $\int_{1-i}^{2+i}(2x+iy+1)dz$ along $x=t+1$ and $y=2t^2-1$. **(6+7+7)**

7.

a. Find all the Taylor's and Laurent's series of $f(z)=\frac{3-2z}{Z^2-3z+2}$ at $z=0$

b. Evaluate by Residue $\oint\frac{z+2}{z(z-1)}dz$ where i). $c:|z|=\frac{1}{2}$

ii). $c:|z|=2$ iii. $c:|z+1|=\frac{1}{2}$

c. Solve the linear differential Equation $y''(x)+2y'(x)+y(x)=x, \quad y(0)=-3,$ $y'(0)=0$ **(6+7+7)**

8.

a. Solve $\frac{dy}{dx}+y=y^2(\cos x-\sin x)$

b. Solve by Convolution Theorem $F(S)=\frac{1}{(s^2+4)(s+1)^2}$

c. State and prove Cauchy's integral formula. **(6+7+7)**