Kafrelsheikh University
Faculty of Engineering
Physics & Engineering Mathematics Dept.
Year: 1st year Elec. Eng. Subject: Engineering Mathematics (2)

Date: 2/1/2019
Time allowed: 3 hours
Full mark: 100
Final Term Exam: 1page

The following questions measure ILOs a1, b1, b7,c1 and c7.

Question 1: (a1,b7,c1) (40 Marks)

1. Find the domain of definition of the following function :

$$f(x,y)=\ln(|x|+|y|-2).$$

2. Can $f(0,0)$ be defined so that $f(x,y)$ is continuous at $(0,0)$ when

$$f(x,y)=\frac{\sin(x^2+y)}{x+y}.$$

3. Let $w=f(x,y)$, $\tan u-\sin v=3x+2y$ and $\cos u-2\ln v=3x-y$ then find $\frac{\partial w}{\partial u}$.

4. Expand in Maclurin series the function, $f(x,y)=\cos 3(x+y)$.

5. Prove that if $z=f(x,y)$ is homogeneous of degree k, then $xz_x+yz_y=kz$, and If $z=\ln[(x^3+2xy^2+y^3)/(x-y)]$ then find the value of xz_x+yz_y.

6. Find the shortest distance from the point $z_0=(1,-2,-1)$ to the straight line

$$x=y=z.$$

7. Verify Green's theorem for the integral $I=\oint_C y\,dx+2x\,dy$,where C is the ellipse

$$x^2+\frac{y^2}{4}=1.$$

Question 2: (b1, b7) (45 Marks)

1. Find the differential equation of the family of circles centered at (C,0) and with radius r=C.

2. Find the orthogonal trajectories of $r=c(\sec\theta+\tan\theta)$.

3. Solve the D. Eqs. :

   A) $(\cos 2x\sin x-xy^2)dx-y(x^2-1)dy=0$ B) $xy'+y=xy^2\ln x$

   C) $xy^2dy+(x^2+1)(y+1)dx=0$

4. Solve the D. Eqs. :

   A) $D^2(D^2+4)(D+1)^2y=4^x+\cos x$. B) $(D^6+5D^4+4D^2)y=2e^x+\sin^2 x$.

   C) $y''+y=\ln(\sin x)$. D) $x^2y''-2xy'+2y=5+2x^2\ln x$.

Question 3: (a1, c7) (15 Marks)

1. Evaluate Laplace transform for:

   A) $f(t)=(t^3+t\cos 2t)\cosh t$. B) $f(t)=e^{2t}\int_0^t \frac{\sin u}{u}\,du$.

2. Find inverse Laplace for:

   A) $L^{-1}\left(\frac{s+2}{s(s^2+1)}\right)$ B) $L^{-1}\left(\ln\frac{s+5}{s-1}\right)$

3. Solve the following differential equation using Laplace transform :

$$y''-y=e^{2t},\quad y(0)=y'(0)=0.$$

Good Luck
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