Benha University
Faculty of Engineering- Shoubra
Mathematics & Eng. Physics Department
Firs Year Electrical Eng. Dep. (Communication)

Final Term Exam
Date: 3/6/2017
Course: Mathematics 2 – B
Duration: **3** hours

Answer following Questions:

Question (1) (14 points)

(a) The Bessel equation of order zero is $x^2y''+xy'+x^2y=0$ show that the roots of indicial equation are $s_1=s_2=0$ and one solution for $x>0$ is $J_0=\sum_{n=0}^{\infty}\frac{(-1)^n}{(n!)^2}\left(\frac{x}{2}\right)^{2n}$.

(b) Show that $\int_0^{\pi/2} J_0(x\cos\theta)\cos\theta d\theta=\frac{\sin x}{x}$

Question (2) (14 points)

(a)Prove that $\int_0^{\pi/2}\cos^{2m-1}\theta\sin^{2n-1}\theta\ d\theta=\frac{\Gamma(m)\Gamma(n)}{2\Gamma(m+n)}$ where $\Gamma(n)$ is the Gamma function

(b)Evaluate $\int_0^2 x\sqrt[3]{8-x^3}\,dx$

Question (3) (14 points)

(a) Evaluate $\int_{-1}^{1} xP_m(x)P_{m-1}(x)dx$ where P_m is Legendre polynomial of degree m .

(b) Show that the function $u=e^x\sin y$ is harmonic function and find the function $\boldsymbol{v}$ such that $f=u+iv$ satisfy Cauchy-Riemann equations.

Question (4) (24 points)

(a)Solve the differential equation $y''+2y'+2y=0$ given that $y(0)=0,\ y'(0)=1$

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

(c)Find inverse Laplace for $F(s)=\frac{1}{(s+1)^4}+\frac{s-3}{s^2-6s+15}$

Question (5) (14 points)

(a) Evaluate $\int_{(3,0)}^{(-3,0)}\frac{(2z-3)}{z}dz$ on the circle $|z|=3$.

(b) Find the complex integration $\int_C\frac{(z^2+3z)}{(z-2)}dz$, on the circle $|z|=5$.

Dr. Fathi Abdessalam