

Benha University Faculty of Engineering- Shoubra Math. and Phy. Eng. Department		1 st Year- Elec. Engineering Mathematics 2 - A Date: 25 / 1 / 2010
الامتحان مكون من (5) أسئلة في صفحة واحدة و المطلوب الإجابة عن كل الأسئلة الزمن 3 ساعات		

Marks

[1](a) Test the series: (i) $\sum_{n=0}^{\infty} \frac{2^n}{2n+1}$ (ii) $\sum_{n=1}^{\infty} \frac{n(-1)^n}{n^3+2}$ (6)

(b) Determine the interval of convergence of the series $\sum_{n=0}^{\infty} \frac{2^n}{(x-2)^n}$ (6)

(c) If $f = xyz$, $\bar{U} = (z)i + (xy)j + (yz)k$. Find $\nabla \cdot (f \bar{U})$ and $\nabla_x (f \bar{U})$. (6)

[2](a) If $u = \cos^{-1}\left(\frac{x^2+y^2}{2x+y}\right)$. Show that $xu_x + yu_y = -\cot u$ (6)

(b) Find the extrema of the function: $f(x, y) = x^2 - y^2 - \frac{2}{y} + 3$ (6)

(c) Find the extrema of $f(x, y, z) = x + 2y + 3z$ subject to $x^2 + y^2 + z^2 = 14$. (6)

[3](a) Find the envelope of the curves $y = \alpha x + \frac{4}{\alpha}$, α is parameter. (6)

(b) Find u, v of $f(z) = z + \sin z$ and show that they satisfy Rieman's equations. (6)

(c) Verify Green's theorem for the integral: $\oint_C (x+y)dx + (3x-y)dy$ where C (10)

is formed by $(x-1)^2 + y^2 = 1$ and $y = x$

[4] Evaluate the integrals: (18)

(a) $\iint_S xy dS$, S is $x^2 + y^2 + z = 1, z \geq 0$ (b) $\int_0^{2\pi} \frac{\cos 3\theta}{5-4\cos\theta} d\theta$

(c) $\oint_C \frac{\cos z}{(2z-\pi)^2} dz$, where C is $|z-2| = 3$

[5] Solve the following differential equations: (24)

(a) $(x+y)dy + (y+e^x)dx = 0$ (b) $xy'' - xy = e^x$ (c) $y'''' - y'' - 2y' = (2-e^x)^2$
(d) $y'' - 2y = x^4$ (e) $(D^2+1)y = \sec x$ (f) $(D^3+D)y = 3 + \cos x$