

Benha University Faculty of Engineering- Shoubra Math. and Phy. Eng. Department		1 st Year- Survey Engineering Mathematics A Date: 16 / 1 / 2010
الامتحان مكون من (5) أسئلة في صفحة واحدة و المطلوب الإجابة عن كل الأسئلة (0) الزمن 3 ساعات		

Marks

[1](a) Test the series: (i) $\sum_{n=1}^{\infty} \frac{n^2}{3^n + 2}$ (ii) $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^4 + 3n}$ (6)

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

(c) If $f(x, y, z) = x^2 + 3yz + 2z^2$. Show that $xf_x + yf_y + zf_z = 2f$ (6)

[2](a) If $\bar{U} = 3i - 2j + 2k$ and $\bar{V} = i + 4j + 2k$. Find $\bar{U} + \bar{V}$, $\bar{U} \cdot \bar{V}$, $\bar{U} \times \bar{V}$ (6)

(b) If $\bar{U} = (y \sin x)i + (z \cos y)j + (xyz)k$. Find $\nabla \cdot \bar{U}$ and $\nabla \times \bar{U}$. (6)

(c) Find the curvature of the curve $x = t^3 + 2t - 1$, $y = t^2 + \ln t$ at $t = 1$ (6)

[3](a) Find the curvature and the circle of curvature of the curve $y = x^4 + 2x - 1$ at the point (1, 2). (8)

(b) Find the maximum and minimum values of the function:

$f(x, y) = x^2 - xy^2 + y$ (6)

(c) Find the extrema of $f(x, y, z) = x^2 + y^2 + z^2$ subject to $x + 2y + 3z = 28$ (6)

[4](a) Find the envelope of the curves $x \sin a + y \cos a = 1$, a is parameter. (6)

(b) Solve the equation $(x + \sin y) dy + (y + \cos x) dx = 0$ (6)

(c) Find the solution of the equation $(D^3 + D)y = \sin x$ (8)

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

(a) $y' + \frac{4}{x}y = \frac{1}{x}$

(b) $y'' + 9y = x^4 + e^{4x}$

(c) $y'' - 6y' + 9y = 3 + e^{3x}$

(d) $(D^2 + 1)y = \tan x$