

Benha University Faculty of Engineering – Shoubra Department of Elec. Eng. and Control Duration: 2 hours		Final Exam Course: Mathematics 3 Code: EMP 201 Date : January, 2019
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The exam consists of one page No. of questions : 4 Answer **All** questions Total Mark: 40

<u>Question 1</u>	
(a) Find the first derivatives of the function F and find ∇F , $\nabla \cdot \nabla F$, $\nabla \times \nabla F$ where $F = e^x + y \ln x - z^3 \cos y$.	4
(b) Find the envelope of the curves : $(x - b)^2 + (y - b)^2 = 2$	4
(c) Determine the extrema of the function : $f(x, y) = x^2 + y^3 - 2xy - 5y$	4
<u>Question 2</u>	
(a) Find \bar{U}_x , $\nabla \cdot \bar{U}$ and $\nabla \times \bar{U}$ where $\bar{U} = (x^2 \sin y)\mathbf{i} + (ye^z)\mathbf{j} + (z \cos x)\mathbf{k}$.	4
(b) From the curve : $x = t^3$, $y = (t + 2)^2$, t in $[1, 2]$. Find the area A , the arc length L and the volume V_x .	6
(c) Find the integral $\int_{(0,0)}^{(2,1)} (x + y^2)dx + (x + y)dy$ through the curve $x = y^3 + 1$	4
<u>Question 3</u>	
(a) Write the Fourier series of $f(x) = x$, $-\pi \leq x \leq \pi$, $f(x + 2\pi) = f(x)$. Also, by Barseval's identity find $\sum_{n=1}^{\infty} \frac{1}{n^2}$	5
(b) Write the Fourier cosine of the function $f(x) = x + 1$, x in $[0, 1]$, $f(x + 2) = f(x)$ Also, by Barseval's identity find $\sum_{n=1}^{\infty} \frac{1}{(2n-1)^4}$	5
<u>Question 4</u>	
Write the Fourier series of $f(x) = \begin{cases} 0, & -2 \leq x < 0 \\ x, & 0 \leq x \leq 2 \end{cases}$ and $f(x + 4) = f(x)$. Also, Find the sum $\sum_{n=1}^{\infty} \frac{1}{(2n-1)^2}$.	4

Good Luck

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