


Benha University Faculty of Engineering – Shoubra Department of Industrial Engineering Duration : 2 hours		Final Exam Course: Mathematics 1 Code: EMP 101 Date: January , 2019
The exam consists of one page No. of questions: 4 Answer All questions Total Mark: 40		
<u>Question 1</u>		
(a) Find y' from the following : (i) $y = x^3 + \cos x$ (ii) $y = x^4 \cdot \ln x$ (iii) $y = \sin x - \log x$ (iv) $y = \frac{2}{3} + (1 + x^3)^4$ (v) $y = 4^x \cdot \sin 3x$ (vi) $y = x + \tan x$	6	
(b) Write the Maclaurin's expansion of : $f(x) = x + \cos x$.	3	
(c) Determine the maximum and minimum points of : $f(x) = 3x^2 - x^3$	3	
<u>Question 2</u>		
(a) Find the limits : (i) $\lim_{x \rightarrow 0} \frac{x}{x + \sin x}$ (ii) $\lim_{x \rightarrow 0} \frac{x}{e^x - 1}$ (iii) $\lim_{x \rightarrow 1} \frac{\ln x}{x - 1}$	3	
(b) Find the integrals: (i) $\int (x + e^x) dx$ (ii) $\int (3 - x^2)^2 dx$ (iii) $\int (x^3 + \cos x) dx$ (iv) $\int (1 + 5^x) dx$ (v) $\int (\frac{1}{x^3} - \sin x) dx$ (vi) $\int 3x^2 \cdot (2 + x^3)^{-5} dx$	6	
<u>Question 3</u>		
(a) If $A = \begin{bmatrix} 2 & -3 & 0 \\ 1 & -2 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 & 4 \\ 1 & 3 & 2 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 3 \\ 0 & 2 \\ 1 & 0 \end{bmatrix}$	6	
Find, if possible, $A + B$, $A + C$, $A \cdot B$, $A^t \cdot B$, $ A $, $ B \cdot C $.		
(b) Find the eigenvalues and the eigenvectors of the matrix $A = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$.	4	
<u>Question 4</u>		
(a) Solve the linear systems : (i) $2x + y + z = 6$, $-x + 2y - 3z = -3$, $x + 2y - 2z = 2$. (ii) $x + y + z = 6$, $-2x + y - 3z = 3$, $-x + 2y - 2z = 8$.	2 2	
(b) Using the binomial theorem, expand : $\frac{1}{\sqrt{1-3x}}$	2	
(c) If $z_1 = 1 - 2i$, $z_2 = 1 + 4i$. Find $z_1 + z_2$, $z_1 \cdot z_2$, $(z_1 + z_2)^7$, $\sqrt[9]{z_1 + z_2}$.	2 3	