Kafrelsheikh University
Faculty of Engineering
Physics & Engineering Mathematics Dept.
Year: Preparatory year

Subject: Engineering Mathematics (2b)
(PHM0001)

Date: 2/6/2018
Time allowed: 3hours
Full mark: 110
Final Term Exam: 2page

All questions cover ILOs: a1,a5,b1,b2 and b7.

Question 1: (25 Marks)

1. Find the equation of the circle centered at (-3,2) and passing through the point (5,8). **(a1,a5,b5) (8 Marks)**
2. Discuss the parabola $r - r\cos\theta - 4 = 0$. **(a5)(8 Marks)**
3. Write the optical property for each of the following conic sections : parabola , ellipse and hyperbola. **(a1,a5,b5)(9 Marks)**

Question 2: (30 Marks)

1. Study the following equation and sketch the graph: $4x^2 + 9y^2 - 32x + 36y + 64 = 0$. **(a1, b5)(10 Marks)**
2. Prove that the equation $3x^2 - 4xy + y^2 - x - y - 2 = 0$ represents pair of lines and find each of them, also find the point its intersection and the angle between them. **(a5,b5)(10 Marks)**
3. If the axes are rotated by angle $(\pi/4)$about the origin, find the new form of the equation: $7x^2 + 2xy + 7y^2 = 4$. **(a1, b5)(10 Marks)**

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Question 3: (30 Marks)

1. Evaluate the following integrals: **(a5,b7)(15 Marks)**

   a. $\int \frac{x^4}{x^3+8}\,dx$ b. $\int \frac{1}{1+\sec x}dx$

   c. $\int \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)dx$

2. Derive the reduction formula for $\int \sin^n x\,dx$ and hence find $\int \sin^4 x\,dx$. **(a5,b7)(8 Marks)**

3. Find the length of the curve $x = a\sin^3\theta$, $y = a\cos^3\theta$ between the points $\theta = 0$ and $\theta = \pi/2$ **(a5,b7) (7 Marks)**

Question 4: (25 Marks)

1. Evaluate an approximate value for $\int_0^{\pi/2} \frac{\sin x}{x}dx$ using Simpson method dividing the interval into 6 subintervals (**n=6**). **(b1,b7)(5 Marks)**

2. Evaluate the integrals: **(a5,b1,b7)(10 Marks)**

   a. $\int_{-\pi/4}^{\pi/4} \frac{(1-\cos 2x)^{5/2}+x\ln(x^2+1)}{\tan^4 x}dx$

   b. $\int \frac{1}{4e^{2x}-3e^x}dx$

3. Find the area between the two curves $y = x^2$ and $y = \sqrt{x}$ between $x = 0$ and $x = 2$. **(a5,b7) (10 Marks)**

With our best wishes

Prof. A.A. Elzaher Nasef nd Dr Samah El-Kholy

A.A. Nasef , Samah