Menoufia University
Faculty of Engineering, Shebin El-Kom,
Civil Engineering Department
First Semester Examination, 2013-2014
Date of Exam: 5/1/2014

Subject: Math (2).
Code :BES 114
Year : 1st year
Time Allowed : 3 hours
Total Marks: 100 marks

Answer the following questions

Question 1: (20 marks)

a) Solve the following differential equations: (10 marks)

i) $(y^2+1)y' + y\sin x\, e^{\cos x} = 0$ *ii)* $\dfrac{dy}{dx} = \dfrac{2x+y-1}{4x+2y+5}$

b) Find the solution of the initial value problem: (5 marks)

$$(D^2+4)y = \sin t + \frac{1}{3}\sin 3t + \frac{1}{5}\sin 5t \qquad y(0)=1, \quad y'(0)=\frac{3}{35}$$

c) Find the Laplace transform of the functions: (5 marks)

i) $f(t) = e^{-3t}\cosh 6t$ *ii)* $f(t) = \dfrac{1-\cos t}{t}$

Question 2 (20 marks)

a) Find the orthogonal trajectories of the curve: (5 marks)

$$x^2 - y^2 = C\,x$$

b) Solve the initial value problem by using Laplace transform: (5 marks)

$$y'' + 2y' + y = \cos 2t \qquad y(0) = -1,\ y'(0) = -3$$

c) Test the convergence of the following series: (10 marks)

i) $\sum \dfrac{2n^2+3n}{\sqrt{n^5+5}}$ *ii)* $\sum \left(\dfrac{n}{n+1}\right)^{n^2}$

Question 3: (20 marks)

a) Find the interval of convergence : $\sum \dfrac{(x-2)^n}{n^5\ 5^n}$ (4 marks)

b) Solve the differential equation: (8 marks)

$$(x^4D^4 + 6x^3D^3 + 15x^2D^2 + 9xD)y = \frac{1}{x^2}$$

c) Find the inverse Laplace transform of the functions: (8 marks)

i) $F(s) = \dfrac{s+1}{(s+1)^2+16}$ *ii)* $F(s) = \dfrac{1}{s(s-1)(s+2)}$

Question 4: (20 marks)

a) Draw and compute the Fourier series of the function: (9 marks)

$$f(x)=\begin{cases}0 & -\pi<x<0\\ x & 0<x<\pi\end{cases}$$

b) Find the mass and center of mass of a triangle lamina with vertices (0,0), (1,0) and (0,2) if the density function is $\rho(x,y)=1+3x+y$ (6 marks)

c) Evaluate the triple integral $\iiint_D yz\cos(x^5)\,dv$ where D is given by (5 marks)

$D:\ 0\le x\le 1,\quad 0\le y\le x,\quad x\le z\le 2x$

Question 5 (20 marks)

a) Solve the ordinary differential equations: (10 marks)

$$i)\ \frac{dy}{dx}=\frac{2xy\,e^{(\frac{x}{y})^2}}{y^2+y^2e^{(\frac{x}{y})^2}+2x^2e^{(\frac{x}{y})^2}} \qquad ii)\ yp^2-2xp+y=0$$

b) Solve the system of simultaneous differential equations:- (5 marks)

$$\frac{dx}{dt}+5x+y=e^t\ ,\ \frac{dy}{dt}-x-3y=e^{2t}$$

c) Draw the periodic function and then find its Laplace transform (5 marks)

$f(t)=e^t \qquad 0<t<2\pi$

With my best wishes ***Dr. Eng. Rizk Masoud***

This exam measures the following ILOs														
Question Number	Q 1-a	Q 1-a	Q 1-b	Q 5-c	Q4-c	Q5-b				Q3-b	Q 5-a			
	Q 2-a	Q 2-b	Q 2-c	Q3-c	Q3-a	Q4-b				Q4-a				
Skills	Knowledge & understanding Skills				Intellectual Skills					Professional Skills				