Kingdom of Saudi Arabia
Ministry of Higher Education
Qassim University
College of Computer

Qassim University

Course: Math218/Differential Equations
Second Semester 1445/1446 (452)

Final Exam
Duration: 3 hours
Date: 03. 06. 2024

Student Name: Mark _____ /50 **ID:**

Answer all the questions.

1. Solve the differential equation $y \sin x dx = \frac{dy}{e}$ by separable variables. **(5 Marks)**

2. Solve the differential equation $y'' + 4y' + 5y = 0$. **(5 Marks)**

3. Find the differential operator that annihilates $x\cos 4x + e^{2x}\sin x$. **(5 Marks)**

4. Solve the given differential equation by undetermined coefficients $y''+5y'+6y = 8$. **(6 Marks)**

5. A 10 volt battery is connected to a series circuit in which the inductance is 2 henry and the resistance is 6 ohms. Determine the current i if the initial current is zero. **(6 Marks)**

6. Evaluate $L^{-1}\left[\frac{1}{(s+5)(s-4)}\right]$ **(5 Marks)**

7. Evaluate (a) $L[5t^2 - \sinh 3t - 7]$ (b) $L[e^{5t}\sin 2t]$. **(6 Marks)**

8. Write the solution of the given initial-value problem **(6 Marks)**
$$x'' + 4x = 0,\ x(0) = 2, x'(0) = 3.$$

9. Solve $\frac{dy}{dt} + 4y = e^{-t},\ y(0) = 1.$ **(6 Marks)**

الحل مب اكيد 100%

Answer all the questions.

1. Solve the differential equation $y\sin x dx = \frac{dy}{x}$ by separable variables. **(5 Marks)**

2. Solve the differential equation $y'' + 4y' + 5y = 0$. **(5 Marks)**

3. Find the differential operator that annihilates $x\cos 4x + e^{2x}\sin x$. **(5 Marks)**

4. Solve the given differential equation by undetermined coefficients **(6 Marks)**
$y''+5y'+6y = 8$.

5. A 10 volt battery is connected to a series circuit in which the inductance is 2 henry and the resistance is 6 ohms. Determine the current i if the initial current is zero. **(6 Marks)**

6. Evaluate $L^{-1}\left[\frac{1}{(s+5)(s-4)}\right]$ **(5 Marks)**

7. Evaluate (a) $L[5t^2 - \sinh 3t - 7]$ (b) $L[e^{5t}\sin 2t]$. **(6 Marks)**

8. Write the solution of the given initial-value problem **(6 Marks)**
$x'' + 4x = 0,\ x(0) = 2, x'(0) = 3.$

9. Solve $\frac{dy}{dt} + 4y = e^{-t},\ y(0) = 1.$ **(6 Marks)**

Q8:-
$m = \pm 2i$
$x = c_1\cos 2t + c_2\sin 2t$
$x' = -2c_1\sin 2t + 2c_2\cos 2t$
$x(0) \Rightarrow 2 = c_1$
$x'(0) \Rightarrow 3 = 2c_2$
$c_2 = \frac{3}{2}$
$y = 2\cos 2t + \frac{3}{2}\sin 2t$

Q6
$As - 4A + Bs + 5B = 1$
$(A+B) = 0,\ 5B - 4A = 1$
$A = -\frac{1}{9},\ B = \frac{1}{9}$
$-\frac{1}{9}e^{-5t} + \frac{1}{9}e^{4t}$

Q7(a)
$\frac{10}{s^3} - \frac{3}{s^2-9} - \frac{7}{s}$
(b) $\frac{2}{s^2+4} \mid s \to s-5$
$\frac{2}{(s-5)^2+4}$