Name ;——————————

Co.No.————————————

Serial No.——

Final Exam

Math 204

King abdulaziz university
Faculty of science
Mathematics Department

8/7/1433 Second term

(Q1) Choose the correct answer of the following; **[10 marks]**

(1) For the equation $M(x,y)dx + (sec^2 y + 3xy^2)dy = 0$ to be exact , $M(x,y)$ must equal;

(a) $y^3 + g(y)$ (b) $y^3 + g(x)$

(c) $y^2 x + g(x)$

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(2) If $y_1 = \frac{1}{4}\sin 2t$ is a solution of $y'' + 2y' + 4y = \cos 2t$ and $y_2 = \frac{t}{4}$ is a solution of $y'' + 2y' + 4y = t$ then the solution to $y'' + 2y' + 4y = 11t - 12\cos 2t$ is;

(a) $y = 11t - 12\sin 2t$ (b) $y = \frac{4}{11}t - 12\cos 2t$

(c) $y = \frac{11}{4}t - 3\sin 2t$

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(3) $\pounds\{e^{3t}\cos 2t\} =$

(a) $\frac{s+3}{s^2 - 2s + 13}$ (b) $\frac{s-3}{(s+3)^2 + 4}$

(c) $\frac{s-3}{s^2 - 6s + 13}$

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(4) $\pounds^{-1}\left\{\frac{3s}{s^2 + 2s + 10}\right\} =$

(a) $e^{-t}\cos 3t + e^{-t}\sin 3t$ (b) $e^{-t}\sin 3t + 3e^{-t}\cos 3t$

(c) $3e^{-t}\cos 3t - e^{-t}\sin 3t$

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(5) $\pounds\{f''\} =$

(a) $s^2\pounds\{f\} - sf'(0) - f(0)$ (b) $s^2\pounds\{f\} - sf(0) - f(0)$

(c) $s^2\pounds\{f\} - sf(0) - f'(0)$

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(6) $\pounds\{\sin^2 t\} =$

(a) $\frac{1}{2s} + \frac{s}{2(s^2+4)}$ (b) $\frac{1}{s} - \frac{s}{(s^2+4)}$

(c) $\frac{1}{2s} - \frac{s}{2(s^2+4)}$

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(7) The O.D.E, $\frac{dy}{dx} = \frac{xy}{x^2 - 1}$ Is;

(a) *Liniar equation* (b) *Homogeneous equation*

(c) *Both*

(8) The Auxilliary equation of $y''' + 2y'' - 4y' - 8y = 0$ has the roots;

(a) $\{-2,2,2\}$ (b) $\{2,-2,-2\}$

(c) $\{2,1,-2\}$

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(9) $\pounds^{-1}\left\{\frac{14}{(s+5)^3}\right\} =$

(a) $14e^{-5t}t^3$ (b) $14e^{5t}t^3$

(c) $7e^{-5t}t^2$

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(10) $\pounds\{\sin 7t\cos 3t\} =$

(a) $\frac{5}{s^2+100}+\frac{2}{s^2+16}$ (b) $\frac{10}{s^2+100}+\frac{4}{s^2+16}$

(c) $\frac{2}{s^2+10}+\frac{5}{s^2+4}$

(Q2) Mark true (T) or false (F) of the following ; **(1 mark each)**

(1) The differential equation $\frac{1}{x}\frac{dy}{dx}-\frac{2y}{x^2} = xy^2$ is a linear in y. [ ]

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(2) $y\frac{dy}{dx} = x \quad ,y(1) = 0$ has unique solution [ ]

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(3) The function $y = 2x^3$ is a solution to $x\frac{dy}{dx} = 3y$ [ ]

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(4) We can solve $y'' - y = \sin^2 x + \cos^2 x$ by undetermined coefficien method . [ ]

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(5) y_1 *and* y_2 are linearly independent if and only if neither of them is constant multiple of the other [ ]

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(6) If $\frac{1}{N}(\frac{\partial M}{\partial y} - (\frac{\partial N}{\partial x}) = 5$,then the integrating factor is $e^{\int dy}$ [ ]

Q(3) Determine the form of a particular solution of

$y'' + 9y = e^{3x} + x\sin 3x + \cos 4x$ (2.5 marks)

Q(4) Find the general solution of the equation ;

$$x\frac{dy}{dx} + y = \frac{1}{y^2}$$ (4 marks)

Q(5) Show that the following equation is Exact ,then Solve it ,

$$3y\ dx + (3x - y - 1)dy = 0$$ (4 marks)

Q(6) Find the particular solution of the equation(by undetermined coefficients);

$y'' - 2y' + 2y = 2x - 2 \qquad y(0) = 0 \quad , y'(0) = 2$ (5 marks)

Q(7) a) prove that $\pounds\{te^{4t}\cosh 3t\} = \dfrac{(s-4)^2+9}{[(s-4)^2-9]^2}$ (3 marks)

b) Find $\pounds\{(t+1)^2 e^{5t}\}$ **by the table** (1.5marks)

Q8) Solve the initial value problem by using the method of laplace transforms;

$$y'' + 6y = t^2 - 1 \qquad y(0) = 0 \; , \; y'(0) = -1$$ **(6 marks)**