



Kingdom of Saudi Arabia
King Abdulaziz University

Faculty of Science - Mathematics Department
Final Exam (120 Minutes) - (Math 204).
25/2/1435 H – 28/12/2013 A.D.
First Semester
1434-1435 H

Model A

| Name: | Section | |
|------------------|---------------------------|--|
| | BA: S.T.R. 10.00 : 10.50 | |
| Student's I.N. : | BA5: S.T.R. 11.00 : 11.50 | |
| | BA2: S.T.R. 13.00 : 13.50 | |
| | BA1: M.W. 8.00 : 9.20 | |
| | BA6: M.W. 9.30 : 11.00 | |
| | BA4: M.W. 9.30 : 11.00 | |

| Q_1 | Q_2 | Q_3 | Q_4 | Q_5 | Q_6 | Total Marks (40) |
|-------|-------|-------|-------|-------|-------|---------------------|
| | | | | | | |

(Answer the following questions)

| 1 | Choose the correct answer | [11 Marks] |
|------|--|------------|
| (1) | The order of differential equation $\frac{d^2y}{dx^2} + 2\left(\frac{dy}{dx}\right)^3 - y = e^x$ is third. (a) true (b) false | |
| (2) | The differential equation $\frac{dx}{dy} + \cos 3x = 9y$ is linear in x . (a) true (b) false | |
| (3) | The differential equation $\frac{dy}{dx} = y(1 + y)$ has the solution $y = -1$ as (a) a singular solution (b) a particular solution | |
| (4) | The general solution of $\frac{d^3y}{dx^3} = 0$ is (a) an exponential function (b) a trigonometric function (c) a polynomial function | |
| (5) | The differential equation $\tan y dx + x \sec^2 y dy = 0$ is an exact (a) true (b) false | |
| (6) | The form of a particular solution y_p of $y'' - 2y' + y = e^x$ is (a) $y_p = Ae^x$ (b) $y_p = Axe^x$ (c) $y_p = Ax^2e^x$ | |
| (7) | $\ell\{f * g\} = \ell\left\{\int_0^t f(\tau) g(t - \tau) d\tau\right\}$ (a) true (b) false | |
| (8) | $\ell\{e^{2t} \sinh 5t\} = \frac{5}{(s - 2)^2 + 25}$ (a) true (b) false | |
| (9) | If $\ell\{f(t)\} = F(s)$ then $\ell\left\{\int_0^t f(\tau) d\tau\right\} = \frac{F(s)}{s}$ (a) true (b) false | |
| (10) | The function $F(s) = \frac{s}{s-4}$ has no Laplace transform (a) true (b) false | |
| (11) | $\ell\{\mathcal{U}(t - a)\} = -\frac{e^{-as}}{s}$ (a) true (b) false | |

2 Solve the differential equation:

[5 Marks]

$$y'' + 2y' - 3y = 3x^2 - 10x$$

3 (a) Solve the differential equation: $y' - \frac{4}{x}y = x^4 e^x$

[4 Marks]

3 (a) Evaluate: $\ell\{\sin^2 t\}$

[2 Marks]

4 Solve $f(t) = 3t^2 + e^{-t} - \int_0^t f(\tau)e^{t-\tau}d\tau$ for $f(t)$.

[5 Marks]

5 Use the Laplace transform to solve the IVP:

[4 Marks]

$$\frac{dy}{dt} + 3y = t^2 e^{-3t}, \quad y(0) = 6$$

6 Evaluate:

[9 Marks]

(i) $\ell^{-1} \left\{ \frac{2s + 5}{s^2 - 2s + 10} \right\}$

[3 Marks]

(ii) $\ell \left\{ \sin t \mathcal{U} \left(t - \frac{\pi}{2} \right) \right\}$

[3 Marks]

(iii) $\ell^{-1} \left\{ \frac{1}{s^2 - 9} e^{\frac{-\pi s}{2}} \right\}$

[3 Marks]