University of Asia Pacific
Department of Basic Sciences & Humanities
Semester Final Examination, Spring 2013
Program: B.Sc. Engineering (Civil, 2nd Year/2nd Semester)

Course No.: MTH 203 | Credits Hrs: 3.0 | Course Title: Mathematics IV
Full Marks: 150 | Time: Three hours

There are two sections in the question paper namely "***SECTION A***" and "***SECTION B***". You have to answer from both sections according to the instruction mentioned in each section.

SECTION A

There are **FOUR** questions in this section. Answer any **THREE**.

Q1. Find the Fourier transform of $f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$ and hence evaluate $\int_{-\infty}^{\infty} \frac{\sin sa \cos sx}{s} ds$. 25

Q2. (a) If $f(x) = e^{-x^2}$, find the Fourier cosine transform. 13

(b) Evaluate the Fourier sine transform of $f(x) = \begin{cases} x & \text{for } 0 < x < 1 \\ 2 - x & \text{for } 1 < x < 2. \\ 0 & \text{for } x > 2 \end{cases}$ 12

Q3. Find the Fourier transform of

(a) $f(x) = \begin{cases} \frac{1}{2\varepsilon}, & |x| < 1 \\ 0, & |x| > 1 \end{cases}$ 13

(b) $f(x) = \begin{cases} 1 - x^2, & |x| < 1 \\ 0, & |x| > 1 \end{cases}$ 12

Q4. Evaluate the finite Fourier sine and cosine transform of 13

(a) $f(x) = 2x,\ 0 < x < 4.$

(b) $f(x) = 1.$ 12

SECTION B

There are **FOUR** questions in this section. Answer any **THREE**.

Q5. Find the Laplace transforms of the functions

(a) $F(t) = t^n.$ 13

(b) $F(t) = e^{at}.$ 12

Q6. (a) Solve the differential equation by using Laplace transform 13

$$y' + y = \sin t, \qquad y(0) = 1.$$

(b) Define Laplace transform. Find the Laplace transforms of the functions $F(t) = 1.$ 12

[Turn over]

Q7. (a) Solve the differential equation by using Laplace transform 13

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

(b) Find the solution the differential equation by using Laplace transform: 12

$$\frac{dy}{dx} - 3y = 0, \qquad y(0) = 1.$$

Q8. (a) By using Laplace transform solve the differential equation: 13

$$x' - 5x = e^{5t}, \qquad x(0) = 0.$$

(b) Find the Laplace transforms of $7e^{2t} + 9e^{-2t} + 5\cos t + 7t^3 + 5\sin 3t + 2$. 12