Philadelphia University
Faculty of Engineering
Dept. of Mechatronics Engineering

Student Name:
Student Number:
First Exam, First Semester: 2014/2015

Course Title: Digital Control	Date: 6/4/2014
Course No: (0640441)	Time Allowed: 50 minutes
Lecturer: Dr. Mustafa Al-Khawaldeh	No. of Pages: 3

Question 1 (9 marks)

i. List the advantages of an open-loop system over a closed–loop system. (4marks)

ii. What is a microcontroller ? (2marks)

iii. Draw the block diagram of a typical digital control system (3marks)

Question 3 **(5 marks)**

Obtain the z transform of the cosine function

$$r(nT) = \begin{cases} 0, & n < 0 \\ cos\ nwT, & n \geq 0 \end{cases}$$

(show your work in details)

Question 4 **(5 marks)**

Obtain the inverse z transform of $\boldsymbol{G(z)} = \frac{\mathbf{10z}}{\mathbf{z^2 - 1.2z + 0.2}}$ using the partial fractions method.

(show your work in details)

Some commonly used z-transforms

$f(kT)$	$F(z)$
$\delta(t)$	1
1	$\dfrac{z}{z-1}$
kT	$\dfrac{Tz}{(z-1)^2}$
e^{-akT}	$\dfrac{z}{z-e^{-aT}}$
kTe^{-akT}	$\dfrac{Tze^{-aT}}{(z-e^{-aT})^2}$
a^k	$\dfrac{z}{z-a}$
$1-e^{-akT}$	$\dfrac{z(1-e^{-aT})}{(z-1)(z-e^{-aT})}$
$\sin akT$	$\dfrac{z\sin aT}{z^2-2z\cos aT+1}$
$\cos akT$	$\dfrac{z(z-\cos aT)}{z^2-2z\cos aT+1}$