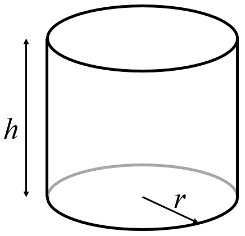
**PRACTICAL EXAMINATION**Subject code: PRF192   
Duration : 85 minutes

**Requirements**:   
+ Write the lines of code on 1 file only. Please name the file as PRF192\_SU24\_PE.c (Any individual information are NOT allowed to be included in file name or code).  
+ Input/output statements are NOT allowed for the questions 1 to 4. All input data must be passed via function parameters, and the output should return by arguments or return value.

+ Strictly follow the instructions of Testing Department for submission.



1. **Cylinder volume calculation** (1.5 points)

Write a function to calculate the volume of a right circular cylinder, given its base radius and height. The right circular cylinder volume can be calculated

where is the area of the cylinder base and is the height of the cylinder.

1. **Construction cost estimation** (2 points)

You are initially estimating the cost to construct your house. The price for each meter squared depends on the area of concrete floor that you want to construct. Specifically, if the area is less than 70, the price is 5 million VND per meter squared. If the area is less than or equal to 150, you are discounted 0.5 million VND per meter squared on the area that is over 70. If the area is larger than 150, the price for each meter squared is 4 million VND on the area that is over 150. Write a function to calculate cost estimation of constructing your house, given the area of concrete floor.

***Examples:***

area of concrete floor = -10, cost estimation = -1

area of concrete floor = 50, cost estimation = 250 million VND

area of concrete floor = 100, cost estimation = 485 million VND

area of concrete floor = 200, cost estimation = 910 million VND

1. **Taylor series application: sin*θ* calculation** (2 points)

Taylor series can be applied to calculate sine of an angle *θ*. Specifically, sine of an angle *θ* can be can be calculated using the following sum:

\documentclass{article}
\usepackage{amsmath}
\usepackage{amssymb}
\usepackage{xcolor}
\DeclareMathOperator{\tr}{Tr}
\newcommand{\rtext}[1]{{\color{red}#1}}
\newcommand{\vect}[1]{\boldsymbol{#1}}
\newcommand{\matr}[1]{\boldsymbol{#1}}
\newcommand{\gset}[1]{\mathbb{#1}}
\DeclareMathOperator{\diag}{diag}
\pagestyle{empty}

\begin{document}
\begin{equation*}
\theta - \dfrac{\theta^3}{3!} + \dfrac{\theta^5}{5!} - \dfrac{\theta^7}{7!} + \cdots \pm \dfrac{\theta^{(2n+1)}}{(2n+1)!}
\end{equation*}


\end{document}

where the absolute of the *n*-th component is bigger than a small positive *epsilon*. It is assumed that PI = 3.14. Write a function to calculate sine of an angle with a given *epsilon.*

***Examples:***

*θ* = 0.523 radians and *epsilon* = 0.01; sine = 0.499483

*θ* = 6.803 radians and *epsilon* = 0.01; sine = 0.499483

*θ* = -0.523 and *epsilon* = 0.01; sine = -0.499483

1. **Character statistic** (2 points)

One step of compressing text source is to detect how many different characters there are in text source. In this question, write a function to generate an array containing different characters which appear in a sentence.

***Examples:***

Input array: Sentence = “This is the first sentence in 10 paragraphs” -> return array: arrayChar = { 'T’,'h', 'i', 's', ' ', 't', 'e', 'f', 'r', 'n', 'c', '1', '0', 'p', 'a', 'g'}

1. **Menu-driven program main function** (2.5 points)

Write main() function to invoke the 4 functions above:  
+ Offer text menu for user choice to execute the functions. (0.5 points)  
+ For each choice, demonstration of successfully running the selected function (2 points for 4 above functions and exit choice)