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 **COURSE:- ENG282**

ENGINEERING MATHEMATICS II (ENG 282) ASSIGNMENT I

Given Date: 24/02/2018 Submission Date: 02/03/2018

EXERCISE An experiment is carried out by a Biomedical Engineer using a certain type of bacteria that doubles in population every 5 hr in a growth medium. If the experiment is commenced with 20 bacteria,

 (a) Develop a model for the system,

 (b) Use the model to estimate the population of the bacteria in 1½ days,

 (c) With the aid of Microsoft Excel, simulate the model and plot the variation of the number of bacteria with time (t) for t = 0 to t = 15 hr using a step time of 0.25 hr,

(d) making the initial number of bacteria to be 10, 30 and 50 successively, plot the variations of the number of bacteria with time for t = 0 to t = 30 hr using a step time of 0.5 hr on the same graph, and

(e) Comment on the results obtained in (d).

Guidelines on Submission (1) All the files used should be zipped and submitted as a single file. (2) Name the zipped file using your matriculation number without any slash. For instance, if your matriculation number is 12/ENG01/001, name your file as 12ENG01001. (3) Also, make the title of the submission to be your matriculation number alone without any slash.

 **SOLUTION**

 **(A)**

Information provided from question.

1. Bacteria doubles after every 5hr.===>> Exponential growth
2. Experiment is commenced with 20 bacteria.

For exponential growth. Y=yo\*Exp(kt)

Yo=20

Y=2yo at t=5

2yo=yo\*exp(k\*5)

ln(2)=5k

k=ln(2)/5=0.1386

k=0.1386

therefore Y=20\*exp(0.1386\*5)

 Y=40

Y=yo\*exp(0.1386)t =======>> Model for the system

Y=20\*exp(0.1386)t

 **(B)**

Using the model to estimate the population of the bacteria in 1½ days.

Converting days to hours.

24hrs=1day

 x = 1½days

x=24\*1.5=36

x=36.

Using the model developed: Y=yo\*exp(0.1386)t having t=36

Y=20\*exp(0.1386\*36)

Y=2937

 **(e)**

For t=0 to t=30hr using step time of 0.5hr when y1 y2 and y3 were plotted.

**Comment on result.**

**Increase in time led to an exponential growth (increase) in the population of the bacteria in the growth medium.**