Unit 6 - Week 4

Quiz: Assignment 04

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

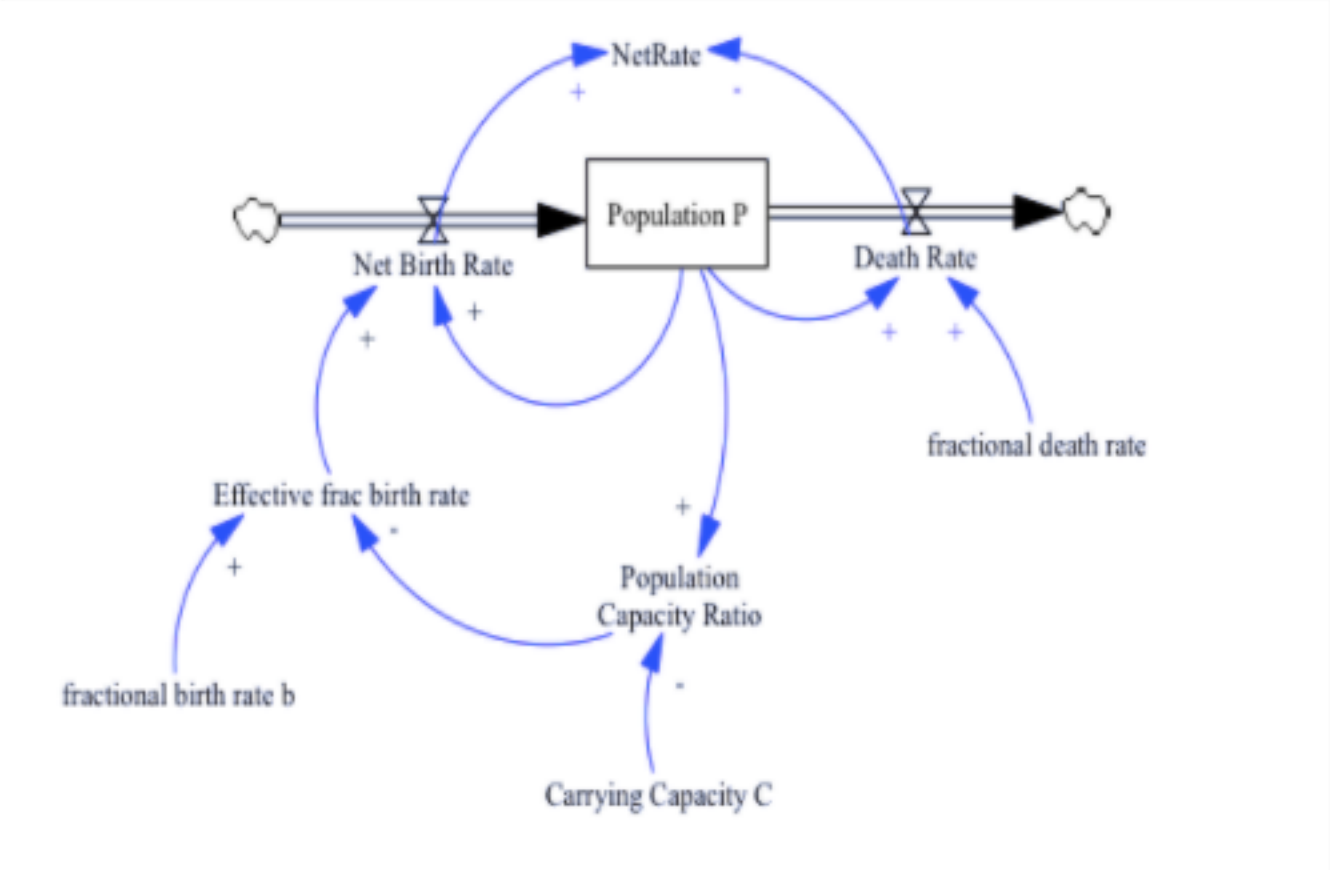
Due on 2020-02-26, 23:59 IST.

1) **Set I:**

Consider the generic population growth with limiting factory model as shown in figure below.

Underlying Equations:
Population Capacity Ratio = Population P / Carrying Capacity C
Effective frac birth rate = factional birth rate b * Population Capacity Ratio
Net Birth Rate = Effective frac birth rate * Population P
Death Rate = fractional death rate * Population P
NetRate = Net Birth Rate – Death Rate
Carrying Capacity C = 1000
fractional birth rate b = 0.2
fractional death rate d = 0.07

Use following information for Model Setting:
FINAL TIME = 100
TIME STEP = 1
Units for Time = Month
Integration Type = Euler



Build an SFD model of the same in in Vensim, and based on the simulation results, answer the Sets A-D questions.

Question Set A: Suppose the initial value of 'Population P' = 2. Answer the questions Q1-Q3.

The value of 'Population P' at year 100 is ______

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 649,650

0.5 points

2) The Net Rate is maximum in year ______.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 47

0.5 points

3) The behaviour of 'Population P' over time is: *0.5 points*

- Exponential Growth
- Exponential Decay/ Goal Seeking
- S-Shaped
- Linear

No, the answer is incorrect.
Score: 0
Accepted Answers:
S-Shaped

4) Question Set B: Suppose the initial value of 'Population P' = 600. Answer the questions Q4-Q6.

The value of 'Population P' at year 100 is ______

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 650

0.4 points

5) The Net Rate is maximum in year ______.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 0

0.5 points

6) The behaviour of 'Population P' over time is: *0.5 points*

- Exponential Growth
- Exponential Decay/ Goal Seek
- S-Shaped
- Linear

No, the answer is incorrect.
Score: 0
Accepted Answers:
Exponential Decay/ Goal Seek

7) Question Set C: Suppose the initial value of 'Population P' = 1500. Answer the questions Q7-Q8.

The value of 'Population P' at year 100 is ______

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 650

0.5 points

8) The behaviour of 'Population P' over time is: *0.5 points*

- Exponential Growth
- Exponential Decay/ Goal Seek
- S-Shaped
- Linear

No, the answer is incorrect.
Score: 0
Accepted Answers:
Exponential Decay/ Goal Seek

9) Question Set D: Suppose the initial value of 'Population P' = 2, and 'fractional birth rate b'= 0.1. Simulate for 100 months Answer the questions Q9-Q11. The value of 'Population P' at year 100 is ______

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 34,35

0.5 points

10) The behaviour of 'Population P' over time from 0 to 100 years is: *0.5 points*

- Exponential Growth
- Exponential Decay/ Goal Seeking
- S-Shaped
- Linear

No, the answer is incorrect.
Score: 0
Accepted Answers:
Exponential Growth

11) Suppose we run the model for more than 100 months (say for 500 month), then the expected behaviour over time of 'Population P' will be: *0.5 points*

- Exponential Growth
- Exponential Decay/ Goal Seeking
- S-Shaped
- Linear

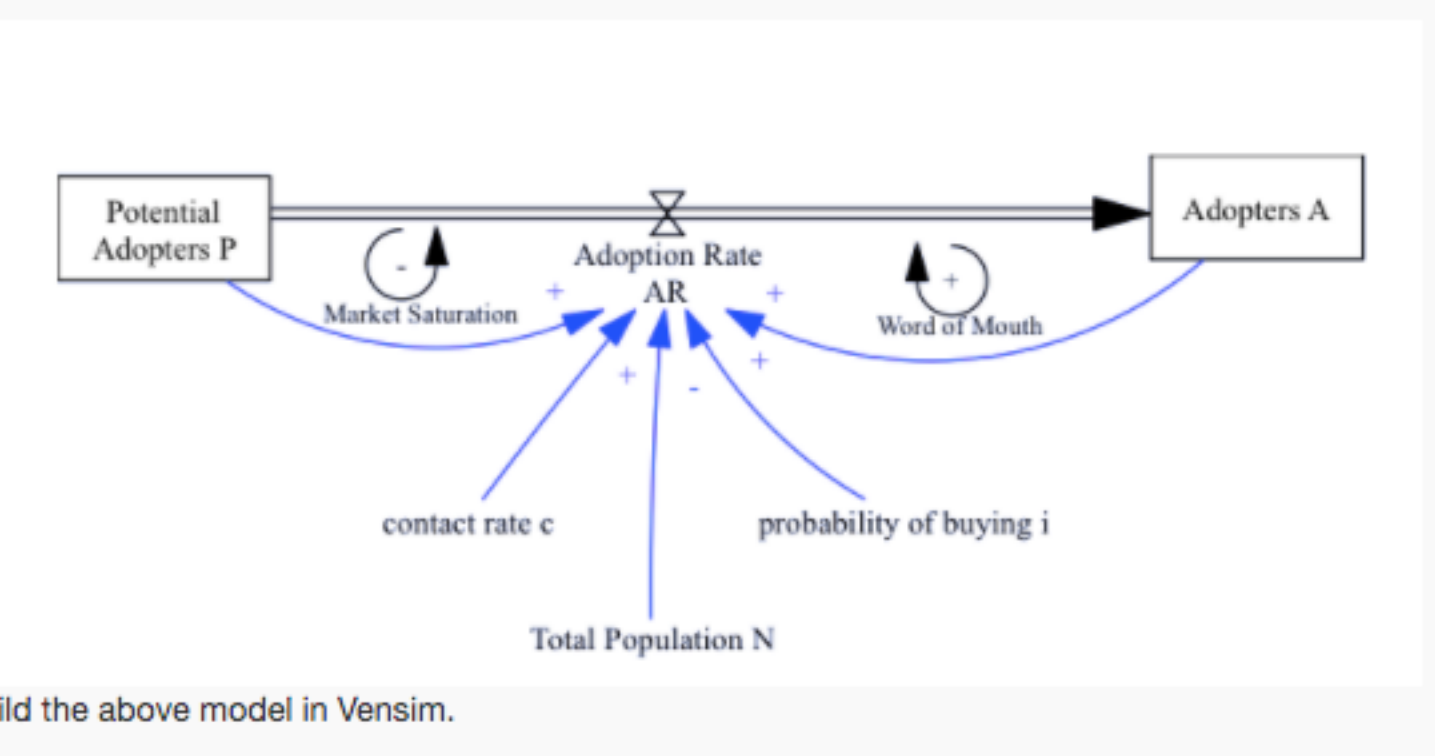
No, the answer is incorrect.
Score: 0
Accepted Answers:
S-Shaped

12) **Set II :New Product Diffusion Dynamics** *0.5 points*

Consider the scenario of new product diffusion as discussed in the lectures:
- Potential Adopters also referred as Non-Owners, or Potential Customers;
- Adopters can also referred as Owners or Actual Customers
- Adoption Rate also referred as Buying Rate or Conversion Rate
- adoption fraction also referred as probability of buying
- contact rate also referred as population interaction

The SFD model of the above scenario is given in Figure below, with the underlying equations:

AR = P*c*i*A/N
Total market or Total population, N = P + A (note: Initial values of P and A to be such that $P_0 + A_0$=N)
A = INTEGRAL (AR)
P = INTEGRAL (-AR)



Build the above model in Vensim.

Model Settings:
Final Time = 10;
Time Step = 0.125;
Units for time = Months
Values: N=100; c = 10/month; i=0.1

Answer Q12-Q16.

The behaviour over time of Adopters A, when A_0 =1 is:

- Exponential Growth
- Exponential Decay/ Goal Seeking
- S-Shaped
- No growth

No, the answer is incorrect.
Score: 0
Accepted Answers:
S-Shaped

13) Suppose A_0 = 1, then, analytically, the maximum or peak value of adoption rate AR will be ________.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 25

0.5 points

14) The behaviour over time of Adopters A, when A_0 = 40 is: *0.5 points*

- Exponential Growth
- Exponential Decay/ Goal Seeking
- S-Shaped
- No growth

No, the answer is incorrect.
Score: 0
Accepted Answers:
Exponential Decay/ Goal Seeking

15) The behaviour over time of Adopters A, when A_0 = 75 is: *0.5 points*

- Exponential Growth
- Exponential Decay/ Goal Seeking
- S-Shaped
- No growth

No, the answer is incorrect.
Score: 0
Accepted Answers:
Exponential Decay/ Goal Seeking

16) The behaviour over time of Adopters A, when A_0 = 0 is: *0.5 points*

- Exponential Growth
- Exponential Decay/ Goal Seeking
- S-Shaped
- No growth

No, the answer is incorrect.
Score: 0
Accepted Answers:
No growth

17) **Set III: New Product Diffusion DataSet**

Suppose the sales rate or adoption rate per month of a particular product is given below for 32 months. We have decided to model this as an innovation diffusion model as shown in previous question. Using analytical logistic equation and the data given, estimate the value of c*i. Assume N=16074, A_0=10, P_0=16064.

Month	Sales
1	10
2	35
3	79
4	89
5	229
6	224
7	221
8	219
9	299
10	399
11	874
12	699
13	874
14	949
15	1249
16	1199
17	1299
18	999
19	1149
20	1149
21	949
22	549
23	449
24	499
25	374
26	424
27	249
28	174
29	74
30	55
31	32
32	2

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.38,0.40

2 points