AC-3105
Second Year B. Sc. (Sem. IV) Examination
April / May – 2015
Mathematical Modelling - II
(Elective Generic) (New Course)

Time : 2 Hours] [Total Marks : 50
Instructions :
(1) Fill up strictly the details of <> signs on your answer book.
Name of the Examination :
SECOND YEAR B. SC. (SEM. IV)
Name of the Subject :
MATHEMATICAL MODELLING - II (NEW)
Subject Code No. : 3 1 0 5 Section No. (1, 2,......). Nil

(2) All questions are compulsory.
(3) Digits to the right of each question indicate its marks.
(4) Follow usual symbols
(5) Use of scientific calculator is permissible.

Q-1 Answer the following questions (Any Two):

[05]
(1) Write only mathematical model for decay of radio active substances .

(2) How long does it take for a given amount of money to get double at 12% per annum compounded
Annually?

(3) In the change of price of commodity model , if d>s then the price of commodity increases or
decreases?

Q-2 (a) Derive mathematical model for radio active decay and solve it.

[08]

OR

(a) Derive mathematical model for Effect of immigration and Emigration on population size and
solve it.

[08]

(b) If Rs. 10,000 is invested at 6% per annum .Find what amount has been deposited after six
years ,if the rate of interest is compounded quarterly and continuously ?

[07]

OR

(b) In an archeological wooden specimen, only 50% of original radio carbon-12 is present .
When was it made?

[07]
Q-3 (a) Derive mathematical model for Newton's law of cooling and solve it.

OR

(a) Derive mathematical model for Fick's law of diffusion and solve it.

(b) The concentration of potassium in a kidney is 0.0025 mg/cm³. The kidney is placed in a large vessel. In which potassium concentration is 0.1140 mg/cm³. In 1 hour the concentration of kidney increases to 0.0027 mg/cm³. After how much time will the concentration be 0.0035 mg/cm³?

OR

(c) A body where temperature t is initially 400°C is placed in a large block of ice, its temperature at the end of 7 and 8 minutes.

Q-4 (a) Derive mathematical model for susceptible–infected persons.

OR

(a) mathematical model for susceptible–infected–susceptible persons.

(b) Integrate \( \frac{dI}{dt} = BI(N + 1 - I) \); when \( t = 0, I(0) = 1 \) then prove that \( I(t) = \frac{n+1}{n}e^{(n+1)\beta t} \)

OR

(b) Integrate \( \frac{dS}{dt} = -\beta S(n + 1 - S) \); when \( t = 0, S(0) = n \) then prove that \( S(t) = \frac{n(n+1)}{n+e^{(n+1)\beta t}} \)