Roll No : .....

Total No. of Questions : **11**] [Total No. of Printed Pages : **3**

ASP–653

M.A./M.Sc. (Final) Examination, 2021

MATHEMATICS

Paper - Opt-XI

(Mathematical Modelling)

(For Due and Imp. Students only)

Time : 1½ Hours] [*Maximum Marks :* ***100***

Section–A **(Marks : 2 × 10 = 20)**

Note :– Answer all *ten* questions (Answer limit **50** words). Each question carries **2** marks.

(खण्ड–अ) **(अंक : 2 × 10 = 20)**

नोट :– सभी **दस** प्रश्नों के उत्तर दीजिए (उत्तर-सीमा **50** शब्द)। प्रत्येक प्रश्न **2** अंक का है।

Section–B **(Marks : 4 × 5 = 20)**

Note :– Answer all *five* questions. Each question has internal choice (Answer limit **200** words). Each question carries **4** marks.

(खण्ड–ब) **(अंक : 4 × 5 = 20)**

नोट :– सभी **पाँच** प्रश्नों के उत्तर दीजिए। प्रत्येक प्रश्न में विकल्प का चयन कीजिए (उत्तर-सीमा **200** शब्द)। प्रत्येक प्रश्न **4** अंक का है।

Section–C **(Marks : 20 × 3 = 60)**

Note :– Answer any *three* questions out of five (Answer limit **500** words). Each question carries **20** marks.

(खण्ड–स) **(अंक : 20 × 3 = 60)**

नोट :– पाँच में से किन्हीं **तीन** प्रश्नों के उत्तर दीजिए (उत्तर-सीमा **500** शब्द)। प्रत्येक प्रश्न **20** अंक का है।

Section–A

2 each

1. (i) Define Epidemic growth Model.

   (ii) Define Prey-Predator Model.

   (iii) Define Domar Macro Model.

   (iv) Define Political model.

   (v) Define first order differential equation.

   (vi) Define non-linear differential equation.

   (vii) Define differential equation.

   (viii) What is equilibrium speed distribution ?

   (ix) Define Mathematical Modeling.

   (x) Define constant Population Size Model.

Section–B

4 each

2. Describe the Population Growth models.

Or

In the given equation $\frac{dN}{dt} = kN(R - N)$.

k = 0.007, R = 1000, N(0) = 50, Find N(10) and find when N(t) = 500.

3. Describe single-species population models.

Or

Derive the formula for population growth an age structure model.

4. Describe the stochastic epidemic model with No Removal.

Or

Describe the spread of Technological Innovation.

5. Describe equilibrium speed distributions.

Or

Explain Prey-Predator Models.

6. Explain Political Model.

Or

Formulate mathematical model for urban waste water management.

Section–C 20 each

7. Formulate the Prey-Predator and single species population model.
8. Derive P.D.E. Model for Birth-Death Immiration.
9. Describe Qualitative solution sketching.
10. Discuss Lotka-Volterra predator-Prey model.
11. Obtain the complementary function by use of Matrices.