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M.Sc. DEGREE EXAMINATION, APRIL 2018.

Mathematics

Fourth Semester

Paper V — MATHEMATICAL MODELLING

Time : Three hours

Maximum : 75 marks

(No additional sheet will be supplied)

PART A — (5 × 5 = 25 marks)

Answer any FIVE questions.

Each question carries 5 marks.

Each answer should not exceed 1 page.

1. Explain Growth and Decay models.
2. Find curves for which tangent at a point is always perpendicular to line joining the point to the origin.
3. Explain Richardson's model.
4. Explain modelling on epidemics.
5. Explain mathematical modelling of circular motion and motion of satellites.
6. Obtain a curve of Pursuit.
7. Define Z-transforms and damping rule.
8. Write an application to Actuarial science.

PART B — (4 × 12½ = 50 marks)

Answer ALL questions.

Each question carries 12½ marks.

Each answer should not exceed 6 pages.

9. Discuss :
  - (a) Simple harmonic motion
  - (b) Motion of a rocket

Or

10. (a) Explain Simple compartment model.  
(b) Explain non-linear growth and decay models.
11. (a) Explain any simple epidemic model.  
(b) Discuss Samuelson investment model

Or

12. (a) Discuss the mathematical modelling in dynamics through systems of ODE of first order.  
(b) Explain motion of a projectile and Gunshells.
13. Explain circular motion of Satellites and Elliptic motion of Satellites.

Or

14. Explain the mathematical modelling through linear differential equations of second order.
15. Explain the mathematical modelling through difference equations in Economics and finance.
16. (a) Explain the mathematical modelling in terms of Heat equation.  
(b) Derive the equation of continuity.

