

RAN-2503000504063001
S. Y. B. Sc. Mathematics (Sem.-IV) Examination April - 2026
MH-SEC-401- Mathematical Modelling (Paper-401)
Time: 1 Hour]
[Total Marks: 25

સૂચના : / Instructions (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી. Fill up strictly the above details on your answer book (2) All Questions are compulsory. (3) First question carry 5 marks and other carries 10 marks. (4) Figures to the right indicate marks of the corresponding Question. (5) Follow usual notations. (6) Use scientific non programmable calculator.	Seat No.: Student's Signature
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- Q. 1. Answer the following:(Any Five) 5**
- Write the statement of Logistic Law of population growth.
 - Obtain the tripling period of the population growth.
 - State the model equation of 'Spread of Infectious diseases'.
 - Differentiate $f(x, y, a) = 0$; a is parameter partially with respect to x .
 - Find the Orthogonal trajectories of the family of curves $y = -x$.
 - Write the differential equation of the family of Orthogonal trajectories of $\varphi\left(x, y, \frac{dy}{dx}\right) = 0$
- Q. 2. Answer the following:(Any Two) 10**
- Find the relation between doubling, tripling and quadrupling times for a population size
 - State the model of growth of Mathematics $M(t)$. In 1900 year, the amount of Mathematics is 1000. If the doubling period is 10 year then Estimate the number of amounts of mathematics in the year 1940.
 - State the population growth model. In an archeological wooden specimen, only 25% of original radio carbon-12 present. Find the time when was it made?
- Q. 3. Answer the following: :(Any Two) 10**
- Find the Orthogonal trajectories of the family of curves $x^2 + y^2 - 2ax = 0$.
 - Obtain the Orthogonal trajectories of the family of curves $r = 2a \cos \theta$.
 - (i) Find curves for which tangent at a point is always perpendicular to the line joining the point to the origin.
(ii) Prove that the Orthogonal trajectories of the family of curves $y = -mx$, m is parameter, is as concentric circles.