

SPECIALITY: Math.teacher

SUBJECT: "ORDINARY DIFFERENTIAL EQUATIONS "

EXAM QUESTIONS

- 1) Main concepts and definitions.
- 2) Geometrical interpretation. Direction Field. Isoklines.
- 3) Separable equations.
- 4) Equations reducible to Separable equations.
- 5) Homogeneous equations.
- 6) Equations reducible to Homogeneous (with the not proportional coefficients).
- 7) Equations reducible to Homogeneous equations (with the proportional coefficients).
- 8) Generalized Homogeneous equations.
- 9) Linear differential equations of the 1-st order (LDE).
- 10) Method of variation of the constant for the LDE.
- 11) Bernoulli equation.
- 12) Riccati equation. Properties.
- 13) Properties of solutions of Riccati equations.
- 14) Exact differential equations. Necessary condition.
- 15) Exact differential equations. Sufficient condition.
- 16) Existence of the Integrating Factor.
- 17) Infinite number of Integrating Factors. .
- 18) Construction of the Integrating Factor.
- 19) Finding of Integrating Factor (integrating factor depends of x).
- 20) Finding of Integrating Factor (integrating factor depends of y).
- 21) Euler's broken.
- 22) Arsel's Theorem (without proof).
- 23) Reducing the Cauchy Problem for the differential equation $y' = f(x, y)$ to the equivalent integral equation.
- 24) Peano Theorem on existence of Solution (scheme of the proof).
- 25) The Method of Successive Approximation in the Pekar theorem (existence of solution).
- 26) The Method of Successive Approximation in the Pekar theorem (uniqueness of solution).
- 27) Continued Solutions.
- 28) Non- Continued Solutions.
- 29) .Smooth property of solution of Equation solvable with respect to derivative.
- 30) Smooth property of solution of Equation non-solvable with respect to derivative.

- 31) Existence and Uniqueness of Solution of the Cauchy Problem for the 1-st order equation non solvable with respect to derivative.
- 32) Finding the Singular Solution (the Method of Discriminant Curve).
- 33) Kurşanlar üsulu. Finding the Singular Solution (the Method of Envelope Curve),
- 34) The Gronwall Lemma.
- 35) Non-complete Differential Equations. (all terms depends of derivative).
- 36) Non-complete Differential Equations (considered function doesn't contains in equation).
- 37) Non-complete Differential Equations (Independent value doesn't contains in equation)
- 38) Non-complete Differential Equations .The General Method of introduction of parameter.
- 39) Non-complete Differential Equations. The General Method of introduction of parameter if equation is solved with respect to derivative.
- 40) Non-complete Differential Equations. The General Method of introduction of parameter if equation isn't solved with respect to derivative.
- 41) Lagrange Equation.
- 42) Clero Equation.
- 43) Normal system of differential equations.General and particular solutions.
- 44) On existence and uniqueness of solution of the Cauchy problem for the Normal system of differential equations.
- 45) Integral of the system.First and General Integrals.Sistem integralı. Birinci və ümumi integral.
- 46) Differentiable Integral .
- 47) Symmetrik form of the System.
- 48) Differential equations of the High order.The Cauchy problem.Existence and uniqueness of solution (without proof)
- 49) General and particular solutions of the differential equation of the high order.First,Middle and Total Integrals.
- 50) The Solvable Equations of the High order.Type $y^{(n)} = f(x)$.
- 51) The Solvable Equations of the High order.Type $F(y^{(n)}, x) = 0$
- 52) The Solvable Equations of the High order.Type $F(y^{(n)}, y^{(n-1)}) = 0$
- 53) The Solvable Equations of the High order.Type $F(y^{(n)}, y^{(n-2)}) = 0$.
- 54) Equations doesn't contains unknown function.
- 55) Equations doesn't contains independent variable.
- 56) Equations of the high order, which are homogeneous with respect to unknown function and its derivatives.
- 57) Equations with the exact differential at the left-hand side.
- 58) Normal system of differential equations.Existence and uniqueness of solution (without proof).
- 59) Fundamental system of solutions for the System of Linear differential equations.Wronsky determinant.

- 60) The General Theory of the Linear differential equations of the High order.
- 61) Linearly dependent and independent systems of functions.
- 62) Fundamental system of solutions for the Linear differential equations of the High order.
- 63) Wronsky determinant for the Linear differential equations of the High order.
- 64) General solution for the Linear differential equations of the High order.
- 65) The Ostrogradsky-Liouville formula for the Linear differential equations of the High order.
- 66) Non homogeneous Linear differential equations of the High order.
- 67) Linear differential equations of the High order. Roots are real and different.
- 68) Linear differential equations of the High order. Roots are complex.
- 69) Linear differential equations of the High order. Roots are repeating.
- 70) The Method of variation of constants for the Linear non-homogeneous differential equations of the High order.
- 71) The Method of undetermined coefficients for the Linear non-homogeneous differential equations of the High order.
- 72) Euler equations.
- 73) Stability by Lyapunov. Main definitions.
- 74) Lemma 1 on the real part of the eigen values of the system with the constant coefficients.
- 75) Lemma 2 on the real part of the eigen values of the system with the constant coefficients.
- 76) Theorem on stability of the trivial solution of the linear system with the constant coefficients.
- 77) Criterion on stability of the quadratic polynomial.
- 78) Hurwitz polynomial.