Enrollment No. :
Centre Code :

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Total number of printed pages = 4

2025

(MOOCs) IDC

Paper : MOOCIDC1013

(Excelling with Mathematical Modelling)

Full Marks : 50

Pass Marks : 20

Time : 2 hours

(Question carries 1 mark each)

Please tick (✓) the correct answer

*Use of correction fluid is prohibited ** Multiple ticks will be treated as incorrect.*

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1. **Mathematical modelling is the process of :**
   A. Collecting random data
   B. Representing real-world problems using mathematical concepts
   C. Drawing graphs only
   D. Avoiding assumptions
2. **Which of the following is NOT a step of mathematical modelling?**
   A. Formulating assumptions
   B. Constructing a model
   C. Validating the model
   D. Ignoring results
3. **A deterministic model is one in which:**
   A. Outcome is uncertain
   B. All variables change randomly
   C. Outcome is completely determined by input
   D. Probabilities must be used
4. **A probabilistic model involves:**
   A. No randomness
   B. Complete certainty
   C. Random variation
   D. Only algebraic equations
5. **Which of the following is a continuous model?**
   A. Number of students
   B. Population growth model
   C. Number of cars
   D. Number of houses
6. **The logistic growth model is commonly used for:**
   A. Unlimited growth
   B. Constant population
   C. Population with carrying capacity
   D. Zero population growth
7. **The equation (y = mx + c) represents a:**
   A. Quadratic model
   B. Linear model
   C. Cubic model
   D. Exponential model
8. **In modelling, assumptions are used to:**
   A. Make the model complicated
   B. Simplify the real-world problem
   C. Avoid calculations
   D. Decrease accuracy
9. **A model is said to be validated when:**
   A. It gives random results
   B. It agrees with real-world observations
   C. It is easy to solve
   D. It is complicated

10. **Exponential growth is represented by:**

A. (y = ax + b)
B. (y = ab^x)
C. (y = x^2)
D. (y = \sqrt{x})

11. **Which type of model uses differential equations?**

A. Discrete model
B. Statistical model
C. Dynamic continuous model
D. Static model

12. **Optimization models aim to:**

A. Minimize or maximize a quantity
B. Reduce accuracy
C. Complicate a system
D. Avoid constraints

13. **A system of linear equations is an example of a:**

A. Nonlinear model
B. Linear model
C. Random model
D. Hybrid model

14. **Linear regression is used for:**

A. Forecasting and prediction
B. Computing integrals
C. Solving quadratic equations
D. Testing hypotheses

15. **In modelling, parameters are:**

A. Unknown inputs
B. Known constants
C. Variables that always change
D. Irrelevant quantities

16. **A simulation model is used when:**

A. Analytical solution is easy
B. Real experiment is impossible or expensive
C. No data exist
D. Model has no variables

17. **A quadratic model has degree:**

A. 1
B. 2
C. 3
D. 4

18. **Which model best describes radioactive decay?**

A. Linear model
B. Quadratic model
C. Exponential decay model
D. Logistic model

19. **In a linear programming model, the objective function:**

A. Must be nonlinear
B. Is irrelevant
C. Is to be maximized or minimized
D. Must be minimized only

20. **Constraints in a model represent:**

A. Resources and limitations
B. Solutions
C. Predictions
D. Outputs

21. **Sensitivity analysis helps to study:**

A. Effects of changes in parameters
B. Only one variable
C. Irrelevant variables
D. Errors in algebra

22. **Which of the following is a discrete model?**

A. Temperature model
B. Daily population count
C. Water flow model
D. Financial interest model

23. **The carrying capacity in logistic growth is the:**

A. Maximum sustainable population
B. Minimum population
C. Average population
D. Zero growth value

24. **In modelling, validation is followed by:**

Contd.

A. Interpretation
B. Guessing
C. Ignoring results
D. Random solving

25. A good mathematical model should be:

A. Overly complex
B. Simple and realistic
C. Very long
D. Hard to understand

26. The purpose of graphical modelling is to:

A. Visualize data and trends
B. Replace equations
C. Avoid analysis
D. Increase errors

27. Time-series modelling deals with:

A. Data over a period of time
B. Only one-time data
C. Random variables only
D. Irrelevant data

28. Which is an example of a nonlinear model?

A. (y = 4x + 2)
B. (y = 3x^2 + 1)
C. (y = 2x - 5)
D. (y = mx + c)

29. Differential equation models describe:

A. Static systems
B. Changing systems
C. Small systems
D. Undefined systems

30. A static model studies:

A. Constant conditions
B. Changes over time
C. Randomness
D. Errors

31. Model refinement is required when:

A. Model fails validation
B. Model is easy
C. Data are perfect
D. No assumptions exist

32. Probability models require:

A. No data
B. Deterministic outcomes
C. Use of random variables
D. Only graphs

33. The term "variables" in modelling refers to:

A. Fixed values
B. Changing quantities
C. Irrelevant numbers
D. Assumptions

34. A real-world advantage of modelling is:

A. No need for experiments
B. Reducing cost and time
C. Replacing mathematics
D. Producing errors

35. A function that describes growth proportional to current size is:

A. Linear
B. Quadratic
C. Exponential
D. Constant

36. A model with too many assumptions tends to be:

A. Realistic
B. Over-simplified
C. Accurate
D. Perfect

37. Mathematical modelling mainly integrates:

A. Theory and application
B. Poetry
C. Music
D. History

38. A predictive model is designed to:

A. Look backward
B. Estimate future outcomes
C. Reduce data
D. Mix variables

39. Which model is appropriate for compound interest?

A. Linear
B. Polynomial
C. Exponential
D. Constant

40. The term *simulation* in modelling means:

A. Creating fictional stories
B. Building virtual experiments
C. Avoiding calculations
D. Only drawing graphs

41. Curve fitting helps in:

A. Matching a curve to a set of data points
B. Removing data
C. Increasing errors
D. Avoiding models

42. An empirical model is based on:

A. Theory only
B. Observations and data
C. Guessing
D. Hypothetical results

43. Which of these is NOT a mathematical model?

A. Equation
B. Graph
C. Table
D. Storybook

44. Linear growth increases:

A. At a constant rate
B. Randomly
C. Exponentially
D. Logarithmically

45. A key requirement for model calibration is:

A. Lack of data
B. Quality data
C. No parameters
D. Avoiding measurement

46. Dimensional analysis is used to:

A. Determine units and consistency
B. Break equations
C. Ignore dimensions
D. Add variables randomly

47. A model with many variables may become:

A. Easier
B. Complex
C. Unchanged
D. Useless always

48. A function of the form (y = kx^n) represents a:

A. Power model
B. Linear model
C. Exponential model
D. Quadratic model

49. The purpose of residual analysis in modelling is to:

A. Study errors in prediction
B. Ignore deviations
C. Eliminate data
D. Predict new variables

50. An ideal model is one that is:

A. Exact and complex
B. Simple, valid, and useful
C. Impossible to solve
D. Always theoretical
