Seat No.

Total No. of Pages : 12

Ph.D. Entrance Examination 2025
Civil Engg.
Sub. Code: 58746

Day and Date : Wednesday, 10-Sep-2025 **Total Marks : 100**
Time : 01.00 pm to 03.00 pm

Instructions:

1) All questions are compulsory.
2) Each question carries 2 mark.
3) Answers should be marked in the given OMR answer sheet by darkening the appropriate option.
4) Follow the instructions given on OMR sheet.
5) Rough work shall be done on the sheet provided at the end of question paper.
6) Only non-programmable calculators are allowed.

Section I- Research Methodology

1. The primary distinction between applied research and fundamental research is:

   a) Applied research seeks new theories, while fundamental research selves immediate problems

   b) Fundamental research aims at knowledge expansion, while applied research solves practical problems

   c) Both are similar but differ in data collection methods

   d) Applied research never uses theoretical frameworks

2. Which of the following best represents a "well-defined research problem"?

   a) Broadly defined topic with scope for multiple interpretations

   b) Clear statement with research objectives, variables, and limitations specified.

   c) Hypothesis without literature review

   d) Topic suggested by funding agencies

3. Ethical issues in research primarily relate to:

   a) Application of mathematical models

   b) Publishing in journals with impact factor

   c) Avoiding plagiarism, respecting consent, and acknowledging sources

   d) Ensuring large sample sizes

4. Which is the most appropriate feature of a good research design?

   a) Complexity and flexibility

   b) Minimization of bias and maximization of reliability

   c) Reliance on convenience sampling

   d) Use of advanced statistical software

5. In experimental design, randomization is primarily used to:

   a) Reduce sample size requirements

   b) Control extraneous variables and eliminate bias

   c) Improve regression models

   d) Simplify literature review

6. A cross-sectional research design is best suited for:

   a) Studying the change in soil strength with curing time

   b) Analyzing stress-strain behavior under cyclic loading

   c) Observing sail properties at a single point of time

   d) Establishing cause-effect relationships

7. Which sampling method provides each population unit with an "equal chance" of being selected?

   a) Stratified sampling

   b) Systematic sampling

   c) Simple random sampling

   d) Cluster sampling

8. Which of the following is NOT a scaling technique?

   a) Likert scale

   b) Semantic differential scale

   c) Guttman scale

   d) Box-plot

9. Which method is most appropriate to study long-term performance of stabilized black cotton soil?

   a) Questionnaire survey

   b) Longitudinal study with repeated observations

   c) Cross-sectional study

   d) Case study

10. The main difference between questionnaire and schedule method of data collection is:

    a) Schedules require field investigator, questionnaires are self-administered

    b) Questionnaires are expensive, schedules are cheap

    c) Schedules cannot be used for illiterate respondents

    d) Questionnaires never include open-ended questions

11. Which of the following measures is "most affected" by extreme values?

    a) Mean

    b) Median

    c) Mode

    d) Geometric mean

12. If the correlation coefficient (r) = 0.95, then coefficient of determination (R^2) = ...

    a) 0.95 b) 0.9025

    c) 0.90 d) 0.975

13. Which statistical test is MOST suitable for comparing mean CBR values of three different soil stabilizers?

    a) Chi-square test b) t-test

    c) ANOVA d) Regression

14. Regression analysis is mainly used for:

    a) Testing independence of variables

    b) Identifying cause-effect relationship

    c) Predicting the value of dependent variable from independent variables.

    d) Measuring data dispersion

15. A negatively skewed distribution implies:

    a) Mean < Median < Mode

    b) Mean > Median > Mode

    c) Median < Mean < Mode

    d) Mean = Median = Mode

16. The null hypothesis (Ho) generally states that:

    a) There is no significant relationship/difference between variables

    b) The hypothesis is always true

    c) The research hypothesis must be rejected

    d) The results are biased

17. In hypothesis testing, "Type I error occurs when:

    a) H_0 is true but rejected
    b) H_0 is false but accepted
    c) H_0 is true and accepted
    d) H_1 is true but rejected

18. Which non-parametric test is best suited for comparing two independent samples?

    a) Kruskal-Walli's test
    b) Mann-Whitney U test
    c) Wilcoxon signed-rank test
    d) Chi-square test

19. Which test should be used for analyzing interaction effects between two independent variables on soil strength?

    a) One-way ANOVA
    b) Two-way ANOVA
    c) Chi-square test
    d) Correlation analysis

20. The Chi-square test is mainly applicable for:

    a) Testing equality of variances
    b) Categorical data and goodness of fit
    c) Comparing population means
    d) Time-series prediction

21. A good research report should NOT contain:

    a) Objectives and scope
    b) Data manipulation to match hypothesis
    c) Methodology and results
    d) Conclusions and recommendations

22. The impact factor of a journal depends on:

    a) Total number of publications in the journal

    b) Average number of citations received per paper published in the journal

    c) Number of authors per paper

    d) Journal subscription rate

23. Citation style used in engineering research (common in civil engineering) is often:

    a) MLA b) APA

    c) IEEE d) Chicago

24. Which of the following is a secondary source of data?

    a) Laboratory test results

    b) Field soil test observations

    c) Published research articles and government reports

    d) Data collected through interview

25. Plagiarism in research refers to:

    a) Quoting others' ideas with proper citation

    b) Using copyrighted material with permission.

    c) Copying others' work without acknowledgment

    d) Publishing in low impact factor journals

Section II - Civil Engineering

26. In a simply supported beam with a uniformly distributed load, where will the maximum bending moment occur?

    a) At supports
    b) At mid-span
    c) At quarter span
    d) At any random point

27. A steel column of 3000 mm length is pinned at both ends. If E = 2 x 10 N/mm^2 and I= 1.6 x 10^7 mm^4, the Euler's buckling load (in kN) is:

    a) 105
    b) 110
    c) 120
    d) 130

28. In prestressed concrete, the loss due to creep of concrete is mainly influenced by:

    a) Elastic modulus of steel
    b) Humidity
    c) Age of concrete at prestressing
    d) Both b and c

29. The ultimate load capacity of a simply supported prestressed concrete beam is governed by:

    a) Shear failure
    b) Flexural failure
    c) Anchorage slip
    d) Creep and shrinkage

30. In a statically determinate truss, if number of members = 25 and number of joints = 14, then the structure is:

    a) Perfect
    b) Redundant
    c) Deficient
    d) Unstable

31. If the permeability of a clay layer is 1 x 107 m/s, the time factor (Tv) for 50% consolidation is 0.197. If the thickness of the layer is 2 m, the time for 50% consolidation (in days) is:

    a) 50 b) 100

    c) 200 d) 400

32. Which IS code is used for soil classification?

    a) IS 2720 (Part III) b) IS 2720 (Part IV)

    c) IS 1498 d) IS 800

33. For a sand deposit with a void ratio of 0.6 and specific gravity of solids 2.65, the dry density is:

    a) 1.2 g/cc b) 1.5 g/cc

    c) 1.7 g/cc d) 2.0 g/cc

34. In a triaxial test on saturated clay under undrained conditions:

    a) Pore pressure remains zero b) Pore pressure increases

    c) Pore pressure decreases d) None of these

35. The Mohr-Coulomb failure criterion relates shear strength to:

    a) Only normal stress b) Cohesion and normal stress

    c) Only cohesion d) Only shear stress

36. The critical depth in an open channel flow depends upon:

    a) Slope of the channel

    b) Roughness of the channel

    c) Discharge and specific energy

    d) Flow velocity only

37. For a pipe flow with Reynolds number 2000, the flow is:

a) Laminar b) Transitional

c) Turbulent d) Supercritical

38. The head developed by a centrifugal pump is proportional to:

a) Speed b) Square of speed

c) Cube of speed d) None of these

39. If discharge in a rectangular channel double, the critical depth will change by a factor of:

a) 2^(1/3) b) 2^(1/2)

c) 2^(2/3) d) 2

40. In dimensional analysis using Buckingham's theorem, the number of dimensionless groups formed is:

a) Equal to number of variables

b) Equal to number of variables minus number of fundamental dimensions

c) Equal to number of fundamental dimensions

d) None of the above

41. Which of the following is an admixture used to accelerate the setting time of concrete?

a) Gypsum b) Calcium chloride

c) Fly ash d) Silica fume

42. In CPM analysis, which activity defines the total project duration?

a) Activity with minimum slack b) Activity with zero float

c) Non-critical activity d) Shortest duration activity

43. If the specific speed of a pump is high, the pump is likely to be:

a) Centrifugal pump
b) Axial flow pump
c) Radial flow pump
d) Mixed flow pump

44. If the design speed on a highway is 80 km/h and the maximum allowable super-elevation is 0.07, the minimum curve radius (in meters) considering $g = 9.81\ m/s^2$ is:

a) 150
b) 200
c) 250
d) 300

45. For a six-activity project, if the critical path has a duration of 30 days and two non-critical paths have floats of 5 days each, the project duration will be:

a) 30 days
b) 35 days
c) 40 days
d) Cannot be determined

46. The permissible noise level in a residential area during daytime according to CPCB norms is:

a) 45 dB
b) 50 dB
c) 55 dB
d) 60 dB

47. Which of the following is NOT a greenhouse gas?

a) CO_2
b) CH_4
c) O_3
d) N_2

48. In EIA, scoping refers to:

a) Prediction of impacts
b) Evaluation of alternatives.
c) Identifying important issues for assessment
d) None of the above

49. In a water treatment plant, alum is used as:

a) Coagulant
b) Disinfectant
c) Oxidizing agent
d) pH controller

50. Which one of the following IS codes deals with water quality standards?

a) IS 456
b) IS 3025
c) IS 10500
d) IS 2720

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-- ROUGH WORK --