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| Seat No. |  |
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**PD - 21**

**Total No. of Pages : 10**

**Ph.d Entrance Examination March - April, 2026**  
**CHEMICAL ENGINEERING**  
**Subject Code: 58750**

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**Day and Date : Wednesday, 07-10-2026**

**Total Marks : 100**

**Time : 04.00 p.m. to 06.00 p.m.**  
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**Instructions :**

- 1) All questions are compulsory.
  - 2) Each question carries 2 marks.
  - 3) Answers should be marked in the given OMR answer sheet by darkening the appropriate option.
  - 4) Use black ball point pen only for marking the circle. Do not make any stray mark on the OMR answer sheet.
  - 5) Follow the instructions given on OMR Sheet.
  - 6) Rough work shall be done on the sheet provided at the end of question paper.
  - 7) Only non-programmable calculators are allowed.
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Section-1

Research Methodology

1. The main purpose of research is to:
  - a) Generate knowledge
  - b) Earn money
  - c) Get promotion
  - d) Collect data only
2. Which one is an example of secondary data?
  - a) Census report
  - b) Field observation
  - c) Interview responses
  - d) Survey questionnaires filled by participants

3. A hypothesis that suggests a relationship between two variables is known as:
  - a) Null hypothesis
  - b) Alternative hypothesis
  - c) Directional hypothesis
  - d) Descriptive hypothesis
4. Which type of sampling uses a fixed interval from a list?
  - a) Random sampling
  - b) Stratified sampling
  - c) Systematic sampling
  - d) Cluster sampling
5. Which of the following is an example of qualitative research?
  - a) Experimental testing
  - b) Ethnographic study
  - c) Regression analysis
  - d) ANOVA test
6. Which scale ranks data but does not indicate magnitude of difference?
  - a) Nominal
  - b) Ordinal
  - c) Interval
  - d) Ratio
7. In research, plagiarism is:
  - a) Using another's work without credit
  - b) Quoting with citation
  - c) Data tabulation
  - d) Paraphrasing in own words
8. The variable that is measured as outcome is called:
  - a) Independent variable
  - b) Dependent variable
  - c) Control variable
  - d) Extraneous variable
9. Which of the following ensures that results are applicable to the entire population?
  - a) Large sample size
  - b) Random sampling
  - c) Use of computers
  - d) Non-probability sampling

10. A diagram that shows the relationship among concepts is:
- a) Conceptual framework
  - b) Research table
  - c) Flow sheet
  - d) Literature map
11. The test commonly used for association between two categorical variables is:
- a) Chi-square test
  - b) T-test
  - c) ANOVA
  - d) Regression
12. Which of the following improves reliability of research results?
- a) Using validated tools
  - b) Using plagiarism software
  - c) Increasing references
  - d) Printing results
13. A statistical summary of previous research studies combined together is:
- a) Case study
  - b) Meta-analysis
  - c) Content analysis
  - d) Survey
14. If a 95% confidence interval includes the value 0, it indicates:
- a) Strong significance
  - b) Non-significance
  - c) Always Type I error
  - d) Always Type II error
15. In research, coding is used to:
- a) Protect data
  - b) Classify responses into categories
  - c) Write software
  - d) Encrypt information

16. The p-value in hypothesis testing represents:
- a) Probability of observed results under null hypothesis
  - b) Sample mean
  - c) Regression slope
  - d) Test statistic
17. Which research design studies a group of people at a single point in time?
- a) Longitudinal
  - b) Experimental
  - c) Cross-sectional
  - d) Case study
18. Which of the following is a non-probability sampling method?
- a) Convenience sampling
  - b) Stratified sampling
  - c) Systematic sampling
  - d) Cluster sampling
19. A blind study in which participants do not know which group they are in is designed to avoid:
- a) Statistical error
  - b) Sampling error
  - c) Bias
  - d) Validity
20. Which part of a thesis contains a review of existing literature?
- a) Abstract
  - b) Introduction
  - c) Methodology
  - d) References
21. An assumption that is tested statistically is known as:
- a) Research design
  - b) Hypothesis
  - c) Conclusion
  - d) Sampling plan

22. The statistical technique to reduce large number of variables into fewer factors is:

- |                    |               |
|--------------------|---------------|
| a) ANOVA           | b) Regression |
| c) Factor analysis | d) Chi-square |

23. Which term refers to data collected directly from respondents?

- |                   |                     |
|-------------------|---------------------|
| a) Secondary data | b) Primary data     |
| c) Derived data   | d) Qualitative data |

24. A measure of spread of data values is:

- |               |           |
|---------------|-----------|
| a) Mean       | b) Median |
| c) Dispersion | d) Mode   |

25. Which of the following is a step in research report writing?

- |                              |                          |
|------------------------------|--------------------------|
| a) Data analysis             | b) Typing OMR sheets     |
| c) Submitting grant proposal | d) Conducting interviews |

## Section - II

## CHEMICAL ENGINEERING CORE

26. The Schmidt number is defined as the ratio of:
- a) Viscosity to density
  - b) Momentum diffusivity to mass diffusivity
  - c) Mass diffusivity to momentum diffusivity
  - d) Heat diffusivity to mass diffusivity
27. The residence time in a CSTR depends primarily on:
- a) Flow rate and reactor volume
  - b) Catalyst type
  - c) Temperature only
  - d) Pressure only
28. Which separation technique is used when boiling points are very close?
- a) Simple distillation
  - b) Extractive distillation
  - c) Evaporation
  - d) Drying
29. The Biot number in heat transfer is a ratio of:
- a) Internal conduction resistance to external convection resistance
  - b) Viscous to inertial forces
  - c) Thermal to mass diffusivity
  - d) Pressure to temperature
30. The reaction rate constant usually varies with:
- a) Catalyst mass only
  - b) Pressure only
  - c) Temperature
  - d) Concentration

31. Which equipment uses centrifugal force for separation?
- a) Cyclone separator
  - b) Scrubber
  - c) Distillation column
  - d) Rotary kiln
32. The logarithmic mean temperature difference (LMTD) is used in:
- a) Absorption tower design
  - b) Heat exchanger design
  - c) Fluidization
  - d) Adsorption column.
33. The Graetz number is associated with:
- a) Heat transfer in laminar flow
  - b) Pressure drop
  - c) Mass transfer in turbulent flow
  - d) Reaction kinetics
34. A PFR (Plug Flow Reactor) is characterized by:
- a) Complete back-mixing
  - b) No mixing along flow direction
  - c) Constant concentration throughout
  - d) Discrete stages
35. In phase rule,  $F = C - P + 2$ , the variable "C" stands for:
- a) Components
  - b) Critical points
  - c) Compounds
  - d) Catalysts
36. The rate-limiting step in adsorption is often:
- a) Film diffusion
  - b) Bulk diffusion
  - c) Catalyst pore formation
  - d) Homogeneous reaction
37. For turbulent flow in a pipe, the velocity profile is generally:
- a) Parabolic
  - b) Nearly flat
  - c) Exponential
  - d) Logarithmic

38. Henry's law relates:

- a) Solubility of gas and partial pressure      b) Heat and mass transfer
- c) Temperature and density                      d) Reaction rate and catalyst

39. Drying rate in the falling-rate period is controlled by:

- a) External conditions                              b) Internal diffusion of moisture
- c) Air velocity only                                  d) Temperature only.

40. The Sherwood number relates:

- a) Convective to diffusive mass transfer
- b) Viscosity to diffusivity
- c) Heat to momentum transfer
- d) Pressure to velocity

41. A column requires  $NTU = 8$  with  $HTU = 0.9$  m. The packed height needed is:

- a) 4.2 m                                                  b) 5.4 m
- c) 6.0 m                                                  d) 7.2 m

42. Which property is intensive?

- a) Mass                                                  b) Volume
- c) Density                                              d) Energy

43. An isothermal process occurs at constant:

- a) Pressure                                              b) Temperature
- c) Volume                                                d) Energy

44. Which method is most suitable for desalination of seawater?

- a) Reverse osmosis                                  b) Sedimentation
- c) Filtration                                            d) Adsorption

45. The Damkohler number compares:
- a) Reaction rate to mass transfer rate
  - b) Diffusion to pressure drop
  - c) Energy input to efficiency
  - d) Enthalpy to entropy
46. Heat loss through a 10 m<sup>2</sup> brick wall of thickness 0.25 m,  $k = 0.8 \text{ W/m} \cdot \text{K}$  inside 60°C, outside 20°C is:
- a) 960 W
  - b) 1.28 kW
  - c) 640 W
  - d) 3.2 kW
47. Water in a pipe:  $D = 0.05 \text{ m}$ ,  $L = 30 \text{ m}$ ,  $v = 1.5 \text{ m/s}$ ,  $f = 0.02$ ,  $\rho = 1000 \text{ kg/m}^3$   $\Delta P \approx$
- a) 9.0 kPa
  - b) 13.5 kPa
  - c) 27.0 kPa
  - d) 5.0 kPa
48. Which of the following is an example of endothermic process?
- a) Combustion of fuel
  - b) Evaporation of water
  - c) Neutralization reaction
  - d) Condensation of steam
49. For a Newtonian fluid, shear stress is proportional to:
- a) Velocity
  - b) Shear rate
  - c) Density
  - d) Pressure
50. The main reason for fouling in heat exchangers is:
- a) Deposition of impurities
  - b) Tube material selection
  - c) High turbulence
  - d) Short residence time



**- Rough Work -**