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PD - 26

Total No. of Pages : 14

Ph.d Entrance Examination March - April, 2026
MECHANICAL ENGINEERING
Subject Code: 58752

Day and Date : Wednesday, 07-10-2026

Total Marks : 100

Time : 10.00 a.m. to 12.00 p.m.

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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1. The primary purpose of research is to:

A) Collect maximum data

B) Generate new knowledge.

C) Prove a predetermined opinion

D) Prepare reports only
2. Which of the following is the first step in the research process?

A) Data analysis

B) Formulation of hypothesis

C) Identification of the research problem

D) Report writing

3. Which of the following is NOT a method for collecting qualitative data?
- A) Interviews
 - B) Focus groups
 - C) Surveys with closed-ended questions
 - D) Observations
4. A hypothesis is:
- A) A proven fact
 - B) A tentative statement that can be tested
 - C) A research report
 - D) A sampling technique
5. Which research design is primarily concerned with establishing cause-and-effect relationships?
- A) Exploratory research
 - B) Descriptive research
 - C) Experimental research.
 - D) Historical research
6. In research, a population refers to:
- A) Only the respondents selected for a study
 - B) The entire group about which the researcher wants to draw conclusions.
 - C) The research sample
 - D) The research team
7. A schedule is generally recorded by
- A) Researcher
 - B) Informants
 - C) Government
 - D) Local body

8. Which of the following is a probability sampling method?
 - A) Convenience sampling
 - B) Judgment sampling
 - C) Simple random sampling
 - D) Snowball sampling
9. Which scale of measurement has a true zero point?
 - A) Nominal
 - B) Ordinal
 - C) Interval
 - D) Ratio
10. In a normal distribution, the highest value of ordinate occurs at
 - A) Mean
 - B) Variance
 - C) Extremes
 - D) Same value occurs at all points
11. Which measure of central tendency is least affected by extreme values?
 - A) Mean
 - B) Median
 - C) Mode
 - D) Range
12. The null hypothesis generally states that:
 - A) There is a significant difference or relationship
 - B) There is no significant difference or relationship
 - C) The research is invalid
 - D) The sample is biased
13. How can researchers minimize bias in data collection?
 - A) By using a small sample size
 - B) By using biased data collection instruments
 - C) By using non-random sampling techniques
 - D) By using appropriate data collection and analysis methods

14. Which statistical test is commonly used to compare the means of two independent groups?

- A) Chi-square test
B) t-test
C) ANOVA
D) Correlation test

15. The abstract of the report:

- A) is usually written before the rest of the report.
- B) provides a snapshot of the major sections of the entire report.
- C) serves as the introduction to the report, with a focus on the background for the research.
- D) is usually several pages in length.

16. ANOVA is primarily used to:

- A) Calculate the median
B) Measure reliability
C) Select a sample
D) Compare the means

17. A research design that collects data from the same subjects repeatedly over a period is called

- A) Cross-sectional study B) Case study
- C) Longitudinal study D) Experimental study

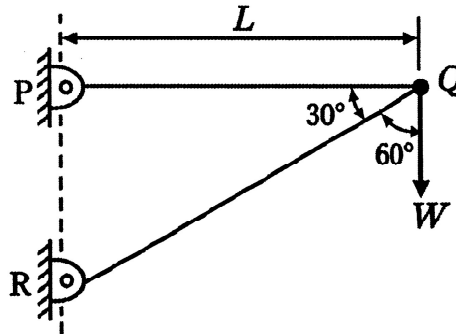
18. Validity refers to:

- A) Consistency of measurement
- B) Sample size
- C) Instrument measures what it is intended to measure
- D) Statistical significance

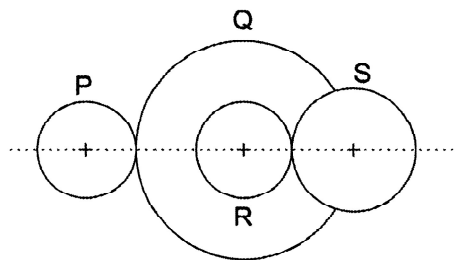
19. Which of the following best describes a literature review in a research report?
- A) A summary of statistical findings only
 - B) A detailed list of references without explanation
 - C) A critical evaluation and synthesis of existing research related to the topic
 - D) An appendix to the research report
20. Which of the following is a primary source of data?
- A) Researcher-conducted interview
 - B) Textbook
 - C) Review article
 - D) Government publication
21. In a research study, the reliability of a measurement refers to
- A) How well the measurement aligns with theoretical constructs
 - B) The consistency of the measurement over time
 - C) The validity of the research findings
 - D) The precision of the data
22. In hypothesis testing, a Type I error occurs when:
- A) A false null hypothesis is rejected
 - B) A false null hypothesis is not rejected
 - C) A true null hypothesis is rejected
 - D) A true null hypothesis is not rejected

23. The main purpose of a pilot study is to
- A) Gather data to support the main study
 - B) Test the feasibility and design of the main study
 - C) Publish initial results
 - D) Obtain funding for research
24. If the correlation coefficient is +1, it indicates:
- A) No relationship
 - B) Perfect negative relationship
 - C) Perfect positive relationship
 - D) Weak relationship
25. The measure of the "central tendency" of data includes all the following EXCEPT
- A) Mean
 - B) Median
 - C) Mode
 - D) Range
26. A circular object of radius r rolls without slipping on a horizontal level floor with the centre having velocity V . The velocity at the point of contact between the object and the floor is
- A) Zero
 - B) V in the direction of motion
 - C) V opposite to the direction of motion
 - D) V vertically upward from the floor

27. A two-member truss PQR is supporting a load W . The axial forces in members PQ and QR are respectively



- A) $2W$ tensile and $\sqrt{3} W$ compressive
 B) $\sqrt{3} W$ tensile and $2W$ compressive
 C) $\sqrt{3} W$ compressive and $2W$ tensile
 D) $2W$ compressive and $\sqrt{3} W$ tensile
28. A compound gear train with gears P, Q, R and S has numbers of teeth 20, 40, 15 and 20 respectively. Gears Q and R are mounted on the same shaft as shown in the figure below. The diameter of the gear Q is twice that of the gear R. If the module of the gear R is 2 mm, the center distance in mm between gears P and S is



- A) 40
 B) 80
 C) 120
 D) 160

29. A single degree of freedom spring mass is subjected to a sinusoidal force of 10 N amplitude and frequency ω rad/s along the axis of the Spring. The stiffness of the spring is 150N/m. damping factor is 0.2 and undamped natural frequency is 10ω rad/s At steady state, the amplitude of the vibration in m is approximately

- A) 0.05 B) 0.07
C) 0.70 D) 0.90

30. Consider the following Statements:

- I. Mating spur gear teeth is an example of higher pair
II. A revolute joint is an example of lower pair.

Indicate the correct answer.

- A) Both I and II are false B) I is true and II is false
C) I is false and II is true D) Both I and II are true

31. In spur gears, the circle on which the involute is generated is called the,

- A) Pitch Circle B) Clearance Angle
C) Base Circle D) Addendum Circle

32. Which one of following is NOT correct?

- A) Intermediate principal stress is ignored when applying the maximum principal stress theory
B) The maximum shear stress theory gives the most accurate results amongst all the failure theories
C) As per the maximum strain energy theory, failure occurs when the strain energy per unit volume exceeds a critical value
D) As per maximum distortion energy theory, failure occurs when the distortion energy per unit volume exceeds a critical value

33. In a linearly hardening plastic material, the true stress beyond initial yielding
- A) Increases linearly with the true strain
 - B) Decreases linearly with the true strain
 - C) First increases linearly and then decreases linearly with the true strain
 - D) Remains constant
34. A solid disc of radius r rolls without slipping on a horizontal floor with angular velocity ω and angular acceleration α . The magnitude of the acceleration of the point of contact on the disc is
- A) Zero
 - B) $r\alpha$
 - C) $\sqrt{(r\alpha)^2 + (r\omega)^2}$
 - D) $r\omega^2$
35. At a hydro-electric power plant site, available head and flow rate are 24.5 m and 10.1 m³/s respectively. If the turbine to be installed is required to run at 4.0 revolutions per second (rps) with an overall efficiency of 90%, then suitable type of turbine for this site is:
- A) Francis
 - B) Kaplan
 - C) Pelton
 - D) Propeller
36. The volumetric flow rate (per unit depth) between two streamlines having stream functions ψ_1 and ψ_2 is
- A) $|\psi_1 + \psi_2|$
 - B) $\psi_1 \psi_2$
 - C) ψ_1 / ψ_2
 - D) $|\psi_1 - \psi_2|$

37. One-dimensional steady state heat conduction takes place through a solid whose cross-sectional area varies linearly in the direction of heat transfer. Assume there is no heat generation in the solid and the thermal conductivity of the material is constant and independent of temperature. The temperature distribution in the solid is
- A) Linear
B) Logarithmic
C) Quadratic
D) Exponential
38. Biot Number signifies the ratio of
- A) Convective resistance in the fluid to conductive resistance in the solid
B) Conductive resistance in the solid to convective resistance in the fluid.
C) Inertia force to viscous force in the fluid
D) Buoyancy force to viscous force in the fluid
39. In a condenser of a power plant the steam condenses at a temperature of 60°C . The cooling water enters at 30°C and leaves at 45°C . The logarithmic mean temperature difference of the condenser is,
- A) 16.2°C
B) 21.6°C
C) 30°C
D) 37.5°C
40. A single-acting two-stage compressor with complete intercooling delivers air at 16 bars. Assuming an intake state of 1 bar at 15°C the pressure ratio per stage is,
- A) 16
B) 8
C) 4
D) 2

41. In Rankine Cycle heat is added
- A) Reversibly at constant volume
 - B) Reversibly at constant temperature
 - C) Reversibly at constant pressure and temperature
 - D) Reversibly at constant pressure
42. Environment friendly refrigerant R134a is used in the new generation domestic refrigerators. Its chemical formula is
- A) CHClF_2
 - B) $\text{C}_2\text{Cl}_3\text{F}_3$
 - C) $\text{C}_2\text{Cl}_2\text{F}_4$
 - D) $\text{C}_2\text{H}_2\text{F}_4$
43. Two cubical castings of the same metal and sizes of 2 cm side and 4 cm side are moulded in green sand. If the smaller casting solidifies in 2 mins, the expected time of solidification of larger casting will be
- A) 16 min
 - B) $2\sqrt{8}$ min
 - C) 8 min
 - D) 4 min
44. The correct Statement pertaining to the friction welding process is
- A) Heat affected zone is not formed
 - B) Flashes are not produced
 - C) Dissimilar materials cannot be joined
 - D) Melting of the base material(s) is not involved
45. Ultrasonic machines used in material removal process, requires ultrasonic transducers which works on the principle of
- A) Eddy Current effect
 - B) Seebeck effect
 - C) Piezoresistive effect
 - D) Magnetostrictive effect

46. During normalizing process of steel, the specimen is heated
- A) Between the upper and lower critical temperature and cooled in still air
 - B) Above the upper critical temperature and cooled in furnace
 - C) Above the upper critical temperature and cooled in still air
 - D) Between the upper and lower critical temperature and cooled in furnace
47. The process in which molten thermoplastic is forced between rolls to produce thin sheets is called
- A) Blow moulding
 - B) Compression Moulding
 - C) Calendaring
 - D) Extrusion
48. In rolling process, sheet of 25 mm thickness is rolled to 20 mm thickness. Roll is of diameter 600 mm and it rotates at 100 rpm. The roll strip contact length will be
- A) 5mm
 - B) 39mm
 - C) 78mm
 - D) 120mm
49. The machines and auxiliary facilities are located according to processing sequence of the product produced in very large quantities in
- A) Process Layout
 - B) Fixed Position Layout
 - C) Product Layout
 - D) Cellular Layout
50. The SQC Chart based on Binomial Distribution is
- A) P chart
 - B) C chart
 - C) $\bar{X}$ chart
 - D) R Chart



- Rough Work -

- Rough Work -