VINAYAKA MISSION'S RESEARCH FOUNDATION, SALEM

(Deemed to be University under section 3 of the UGC Act 1956)

Ph.D Entrance Test – November – 2025

Faculty of Engineering & Technology

Mechanical Engineering

Instructions / Note:

1. Answer all the questions. Each question carries one mark.
2. No negative marks for wrong answers.
3. Read each question carefully and answer in the OMR sheet provided for each question with only blue/ black pen to fill the circles in the OMR Sheet.
4. Question number 1 - 35 questions belong to Research Methodology component and Question number 36-70 questions belong to the subject at PG level
5. Return the question paper along with the OMR sheet.

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36. Which thermodynamic system allows both mass and energy to cross its boundary?
    A. Closed system
    B. Isolated system
    C. Open system
    D. None of the above

37. If a piston/cylinder with a cross-sectional size of 0.01 m2 is resting on the stops, what should the water pressure be to lift the piston with an outside pressure of 100 kPa?
    A. 218 kPa
    B. 168 kPa
    C. 198 kPa
    D. 318 kPa

38. The throttling process in a refrigerator is an example of an _____
    A. Isochoric process
    B. Isenthalpic process
    C. Isothermal process
    D. Adiabatic process

39. In a throttling device (like a partially opened valve), what happens to the enthalpy during a steady-flow process, assuming changes in potential and kinetic energy are negligible?
    A. Enthalpy increases
    B. Enthalpy decreases
    C. Enthalpy remains constant (isenthalpic)
    D. Enthalpy change depends on heat transfer

40. Once-through boilers are designed to operate at pressures above the critical pressure. What is the approximate value of the critical pressure for water?
    A. 1 bar
    B. 100 bar
    C. 221.2 bar
    D. 500 bar

41. The value of the Bulk Modulus of elasticity for an ideal incompressible fluid is _____
    A. Zero
    B. Unity
    C. Infinity
    D. Very low

42. In an ideal impulse turbine, the steam is expanded in ____
    A. Moving blades only
    B. Nozzles only
    C. Both fixed and moving blades
    D. None of the above

43. The rate of heat transfer for a plane wall of homogenous material with constant thermal conductivity is given by which of the following equation?
    A. $Q = 2k/\delta x$
    B. $Q = 2kA\delta x$
    C. $Q = kA (t_1-t_2)/\delta$
    D. $Q = 2kAx/ \delta$

44. For laminar flow in a pipe, the Darcy friction factor (f) depends on _____
    A. Reynolds number and relative roughness
    B. Relative roughness only
    C. Reynolds number only
    D. None of the above

45. For a fully developed flow of water in a pipe having a diameter of 10 cm, Velocity of 0.1 m/s, and Kinematic Viscosity of 10^{-5} m^2/s, the value of Darcy's friction factor is _____
    A. 0.064
    B. 0.032
    C. 0.016
    D. 0.008

46. Which of the following points is typically well-defined in the stress-strain curve of low carbon (mild) steel but is less distinct in high carbon steel?
    A. Proportional limit
    B. Ultimate tensile strength
    C. Fracture point
    D. Yield point

47. The total area under the stress-strain curve up to the point of fracture represents the material's _____
    A. Hardness
    B. Elasticity
    C. Toughness
    D. Stiffness

48. A mild steel wire 5mm in diameter and 1m long. If the wire is subjected to an axial tensile load of 10 kN, what will be its extension?
    A. 3.15 mm
    B. 2.55 mm
    C. 2.65 mm
    D. 2.45 mm

49. A bearing designed to accommodate loads acting parallel to the axis of rotation is called a _____
    A. Radial bearing
    B. Journal bearing
    C. Thrust bearing
    D. Slipper bearing

50. While designing shaft on the basis of torsional rigidity, angle of twist is given by ____
    A. Ml/Gd^4
    B. $584Ml/Gd^4$
    C. $292\ Ml/Gd^4$
    D. None of the above

51. The relation between the number of links (l) and the number of binary joints (j) for a kinematic chain having constrained motion is given by j = 3/2 (l – 2). If the left hand side of this equation is greater than the right hand side, then the chain is _____
    A. Locked chain
    B. Completely constrained chain
    C. Successfully constrained chain
    D. Incompletely constrained chain

52. The efficiency of flat belt drive is 35%. If all the parameters are same and flat belt is replaced by V belt, than the efficiency of V belt will be?
    A. <35%
    B. >35%
    C. =35%
    D. Cant be determined

53. Which of the following statements is true regarding chain drives?
    A. They operate silently
    B. They require lubrication at proper periods
    C. They are suitable for non-parallel shafts
    D. They are typically used for very long distances

54. In which of the following machines is the velocity ratio constant?
    A. Chain Drives and gears
    B. Belt Drives
    C. Rope Drives
    D. Belt and Rope Drives

55. Which of the following components is mainly manufactured by the forging process for high strength requirements?
    A. Piston
    B. Engine block
    C. Connecting rod
    D. Crank case

56. Forging is a manufacturing process involving the shaping of metal using which type of force?
    A. Tensile
    B. Shear
    C. Compressive
    D. Torsional

57. Which of the following articles is typically manufactured using riveting?
    A. Helmets
    B. Rail wagons
    C. Pressure vessels
    D. Engine blocks

58. Welding is a metal joining technique that involves heating metals to their melting point, causing them to fuse when cooled. This process creates a bond that is typically _____
    A. Weaker than the base metals
    B. Slightly weaker than the base metals
    C. As strong as the base metals
    D. Easily removable

59. In blanking and piercing processes, the stress produced in the metal by the applied forces is Primarily _____
    A. Tensile stress
    B. Compressive stress
    C. Bending stress
    D. Shear stress

60. Which surface finishing process is primarily intended to provide a good surface finish rather than significantly changing the dimension of the part?
    A. Grinding
    B. Buffing
    C. Machining
    D. Filing

61. What is the primary function of a cone pulley arrangement in a traditional belt-driven lathe machine?
    A. To drive the lead screw for threading operations
    B. To change or vary the spindle speed
    C. To provide power feed to the carriage
    D. To reverse the direction of rotation of the spindle

62. In a lathe's gear train or historical belt mechanism, a drive is sometimes taken from the spindle (often via a cone pulley system) to a tumbler gear arrangement. This system ultimately transmits power to the _____
    A. Tailstock
    B. Cross slide
    C. Feed rod and lead screw
    D. Tool post

63. In a mechanical system, if a body vibrates on its own after an initial disturbance and no other external force is present, the resulting vibrations are called _____
    A. Forced vibrations
    B. Free vibrations
    C. Self-excited vibrations
    D. Random vibrations

64. The speed at which a rotating shaft tends to vibrate violently in the transverse direction due to the rotational speed coinciding with the natural frequency is termed as _____
    A. Whirling speed or Critical speed
    B. Operating speed
    C. Resonance speed
    D. Damped speed

65. In damped vibrations, the amplitude of the resulting vibration over time _____
    A. Remains constant
    B. Gradually increases
    C. Gradually diminishes
    D. Becomes infinite

66. Which part of the lathe machine moves perpendicular to the axis of the spindle (or the workpiece axis) to generate a flat surface on the end of the workpiece?
    A. Carriage
    B. Tailstock
    C. Headstock
    D. Cross slide

67. The operation of producing a flat surface at the end of a workpiece is known as _____
    A. Turning
    B. Thread cutting
    C. Facing
    D. Knurling

68. The carriage of a lathe machine moves in which direction relative to the workpiece axis?
    A. Perpendicular
    B. Parallel
    C. Inclined
    D. Normal

69. In a cantilever beam, where is the deflection always zero?
    A. At the free end
    B. At the mid-span
    C. At the fixed end
    D. Throughout the beam

70. What is the formula for the maximum deflection at the free end of a cantilever beam of length 'L' subjected to a concentrated load 'W' at the free end (where EI is the flexural rigidity)?
    A. $WL^3/2EI$
    B. $WL^3/3EI$
    C. $WL^3/4EI$
    D. $WL^3/8EI$