PUNJAB TECHNICAL UNIVERSITY
JALANDHAR

Max. Marks: 90 **Time: 90 Mins.**

Entrance Test for Enrollment in Ph.D. Programme

Important Instructions

- ***Fill all the information in various columns, in capital letters, with blue/black ball point pen.***
- ***Use of calculators is not allowed. Use Blue/Black ball point pen for attempting the questions.***
- ***All questions are compulsory. No negative marking for wrong answers.***
- ***To attempt a question, make a tick mark (√) at the right option/answer.***
- ***Each question has only one right answer.***
- ***Questions attempted with two or more options/answers will not be evaluated.***

Subject *(Engg./Arch./Pharm./Mgmt./Sciences)* **ENGINEERING**

Discipline / Branch **MECHANICAL**

Name .....

Father's Name .....

Roll No. ..... Date : **10-07-2010**

Signature of Candidate .....

Signature of Invigilator .....

1. A scientific law is a statement that
a) we postulate to be true
b) is generally observed to be true
c) is derived from a mathematical theorem
d) is a summary of experimental observations

2. In steam tables, the entropy is shown as zero for
a) saturated vapour at atmospheric pressure
b) saturated liquid at atmospheric pressure
c) saturated vapour at 0°C
d) saturated liquid at 0°C

3. For a closed system, the difference between the heat added to the system and the work done by the system is equal to the change in
a) enthalpy
b) entropy
c) temperature
d) internal energy

4. For the same maximum pressure and heat input, the most sufficient cycle is
a) Diesel cycle
b) Dual cycle
c) Otto cycle
d) Sterling cycle

5. In radiative heat transfer, a gray surface is one
a) which appears gray to the eye
b) whose emissivity is independent of wavelength
c) which has reflectivity equal to zero
d) which appears equally bright from all directions

6. In a petrol engine the tendency for knocking decreases with
a) increase in charge temperature
b) increase in cylinder diameter
c) increase in compression ratio
d) decrease in atmospheric humidity

7. Morse test can be used on
a) low horsepower engines only
b) variable speed engines only
c) Multi-cylinder engines only
d) water cooled engines only

8. The shell of the Cochran boiler is made hemispherical
a) to provide maximum strength and space
b) to withstand high pressure inside
c) both (a) and(b) above
d) none of the above

9. Steam turbines are used for
a) electric generation
b) direct drive of fans, compressors and pumps
c) large marine propulsion
d) all of the above

10. In reciprocating steam engines
a) pressure energy of steam is used and dynamic action of steam is negligible
b) pressure energy and dynamic action of steam is used
c) pressure energy is negligible and dynamic action of steam is used
d) none of the above

11. Heat transfer takes place according to
a) Zeroth Law of Thermodynamics
b) First Law of Thermodynamics
c) Second Law of Thermodynamics
d) Third Law of Thermodynamics

12. Heat is mainly transferred by conduction, convection and radiation in
a) insulated pipes carrying hot water
b) refrigerator freezer coil
c) boiler furnaces
d) condensation of steam in a condenser

13. Boundary layer is defined as
a) a thin layer at the surface where gradients of both velocity and temperature are small
b) a thin layer at the surface where velocity and temperature gradients are large
c) a thick layer at the surface where velocity and temperature gradients are large
d) a thin layer at the surface where gradients of both velocity and temperature are large

14. The ratio of energy transferred by convection to that by conduction is called
a) Stanton number
b) Nusselt number
c) Biot number
d) Preclet number

15. Drop wise condensation usually occurs on
a) glazed surface
b) smooth surface
c) oil surface
d) coated surface

16. When the lower temperature is fixed, COP of a refrigerating machine can be improved by
a) operating the machine at higher speeds
b) operating the machine at lower speeds
c) raising the higher temperature
d) lowering the higher temperature

17. During sensible cooling
a) relative humidity remains constant
b) wet bulb temperature increases
c) specific humidity increases
d) partial pressure of vapour remains constant

18. Evaporative aircooler is used effectively when
a) dry bulb temperature is very close to the wet bulb temperature
b) dry bulb temperature is high and relative humidity is high
c) dry bulb temperature is low and relative humidity is high
d) dry bulb temperature is high and the relative humidity is low

19. Refrigerant Freon 12 belongs to
a) methane family
b) ethane family
c) ketone family
d) aldehyde family

20. Sometimes refrigerant plants use cooling towers. The water cooled in these towers is used
a) for defrosting evaporator coils
b) to cool compressor cylinder only
c) to cool the evaporator coils
d) to cool refrigerant in condenser

21. When subjected to shear force, a fluid
a) deforms continuously no matter how small the shear stress may be
b) deforms continuously only for large shear forces
c) undergoes static deformation
d) deforms continuously only for small shear stresses

22. For the bodies in floatation to be in stable equilibrium, the necessary and sufficient condition is that the centre of gravity is located below the
a) centre of gravity
b) centroid
c) metacentre
d) epicenter

23. For a fluid the shear stress was found to be directly proportional to the rate of angular deformation. The fluid is classified as
a) Newtonian
b) Non- Newtonian
c) Dilantant fluid
d) Thixotropic

24. A real fluid is any fluid which has
a) surface tension and is incompressible
b) zero shear stress
c) constant viscosity and density
d) viscosity

25. The pressure measure with the help of pressure called
a) atmospheric pressure
b) gauge pressure
c) absolute pressure
d) mean pressure

26. A jet engine works on the principle of
a) conservation of energy
b) earth's gravity
c) conservation of linear momentum
d) none of the above

27. Kinetic friction is the
a) tangent of angle between normal reaction and the resultant of normal reaction & the limiting friction
b) ratio of limiting friction and normal reaction
c) the friction force acting when the body is in motion
d) the friction force acting when the body is just about to move

28. A test specimen is stressed slightly beyond the yield point and then unloaded. Its yield strength will
a) decrease
b) increase
c) remains same
d) becomes equal to ultimate tensile strength

29. The bolts in a rigid flanged coupling connecting two shafts transmitting power are subjected to
a) shear force and bending moment
b) axial force
c) torsion
d) torsion and bending moment

30. For most brittle materials generally ultimate strength in compression is much larger than the ultimate strength in tension because
a) of flaws such as microscopic cracks or cavities
b) compression failure is due to normal stress and failure in tension is due to shear stress
c) yield point does not occur in compression
d) of inherent properties of materials

31. A ductile structure is defined as one for which the plastic deformation before fracture
a) is smaller than the elastic deformation
b) vanishes
c) is equal to the elastic deformation
d) is such larger than the elastic deformation

32. Two bars one of material A and other of material B of same length are tightly secured between two unyielding walls. Coefficient of thermal expansion of bar A is more than that of B. When temperature rises the stresses induced are
a) tension in both materials
b) tension in material A and compression in material B
c) compression in material A and tension in material B
d) compression in both materials

33. A ductile material is one which is having
a) a small strain upto rupture
b) a relatively large tensile strain upto the point of rupture
c) no change in volumetric strain
d) a large strain upto yield point.

34. If the shear force at a section of a beam under bending is equal to zero then the bending moment at the section is
a) zero
b) maximum
c) minimum
d) minimum or maximum

35. A Mohr's circle reduces to a point when the body is subjected to
a) pure shear
b) uniaxial stress only
c) equal and opposite axial stresses on two mutually perpendicular planes, the planes being free of shear
d) equal axial stresses on two mutually perpendicular planes, the planes being free of shear

36. Under torsion, brittle materials generally fail
a) along a plane perpendicular to its longitudinal axis
b) in the direction of minimum tension
c) along surfaces forming 45° angle with the longitudinal axis
d) not in any specific manner

37. Materials are softened by
a) carburising
b) tempering
c) normalizing
d) annealing

38. A peritectic reaction is defined as
a) two solids reacting to form a liquid
b) two solids reacting not to form a liquid
c) a liquid and solid reacting to form another solid
d) two solids reacting to form a third solid

39. Ball bearings are provided with a cage
a) to reduce friction
b) to maintain the balls at a distance apart
c) to prevent the lubricant from flowing out
d) to facilitate slipping of balls

40. In gears, interference takes place when
a) the tip of a tooth of a mating gear digs into the portion between base and root circles
b) gears do not move smoothly in the absence of lubrication
c) pitch of the gear is not same
d) gear teeth are undercut

41. Flat belt is limited for the transmission of
a) moderate power from one pulley to another in which distance between pulley is no criterion
b) moderate power from one pulley to another when the two pulley are placed more than 8m apart
c) moderate power from one pulley to another when the two pulley are not more than 8m apart
d) all of above

42. Which one of the following is true for involute gears?
a) interference is inherently absent
b) variation in centre distance of shafts increases radial force
c) a convex flank is always in contact with concave flank
d) pressure angle is constant throughout the teeth engagement

43. The type of coupling used to join two shafts whose axes are neither in same straight line nor parallel but intersect is
a) flexible coupling
b) chain coupling
c) universal coupling
d) flange coupling

44. As per IBR., the thickness of boiler shell should not be less than
a) 4 mm
b) 6 mm
c) 7 mm
d) 8 mm

45. By cold working of materials, the fatigue strength
a) increases
b) decreases
c) remains same
d) none of the above

46. The difference between upper limit and lower limit of a dimension is known as
a) basic size
b) actual size
c) tolerance
d) nominal size

47. Square threads are generally used in
a) railway carriage couplings
b) spindles of bench vices
c) screw cutting lathes
d) feed mechanism of machine tools

48. In spur gears, the higher pressure angle results in
a) bigger gear size
b) weaker teeth
c) wider base and stronger teeth
d) narrow base and weaker teeth

49. Which of the following type of pipe joint is mostly used for pipes carrying water at low pressures
a) socket
b) nipple
c) union
d) spigot and socket

50. The piston road of a steam engine is usually connected to the cross head by means of
a) bolted joint
b) cotton joint
c) universal joint
d) knuckle joint

51. Which one of the following theory is related to the theory of the thermocouple?
a) piezoelectric effect
b) skin effect
c) Seeback effect
d) Faraday's Law

52. Mohr's scale is used in connection with
a) composition of metal
b) hardness of materials
c) wear criterion of metals
d) tensile strength of metals

53. Investment casting is used for
a) shapes which are made by difficulty using complex patterns in sand casting
b) mass production
c) shapes which are very complex and intricate and can't be cast by any other method
d) there is nothing like investment casting

54. Blow holes are casting defects
a) which occur due to some sand shearing from the cope surface
b) which takes the form of internal voids of surface depression due to excessive gaseous material not able to escape
c) which occur due to discontinuity in metal casting resulting from hindered contraction
d) caused by two streams of metals that are too cold to fuse properly

55. Laser is produced by
a) graphite
b) ruby
c) diamond
d) emerald

56. The major problem in hot extrusion is
a) design of punch
b) design of die
c) wear and dear of die
d) wear of punch

57. File used for wood work is
a) single cut file
b) double cut file
c) rasp cut file
d) none of the above

58. An example of fusion welding is
a) arc welding
b) gas welding
c) thermit welding
d) forge welding

59. Gases used in tungsten inert gas welding are
a) hydrogen and oxygen
b) CO_2 and H_2
c) argon and neon
d) argon and helium

60. Oxy-acetylene flame as used to weld
a) steel
b) copper alloys
c) stainless steel
d) cast iron

61. Orthogonal cutting system is also known as
a) one-dimensional cutting system
b) two-dimensional cutting system
c) three-dimensional cutting system
d) none of the above

62. In metal cutting operations discontinuous chips are produced while machining
a) brittle material
b) ductile material
c) hard material
d) soft material

63. Term CLA (Centre Line Average) is used for
a) surface finish
b) surface hardness
c) cutting tool hardness
d) none of the above

64. Knurling is an operation of
a) cutting smooth collars
b) under cutting
c) roughing the surface for hand grip
d) none of the above

65. Erosion of metal occurs due to rapidly recurring spark discharges impinging against the surface of the work piece in
a) EDM process
b) ECM process
c) ultrasonic process
d) PAM process

66. Accuracy is
a) the repeatability of a measuring process
b) error of judgment in recording an observation
c) the ability of instrument to reproduce same reading under identical situations
d) agreement of the result of a measurement with the true value of the measurement with the true value of the measure quantity

67. Autocollimator is used for
a) parallelism measurement
b) straightness measurement
c) flatness measurement
d) angular measurement

68. Clearance between two mating surfaces is checked by
a) snap gauges
b) feller gauges
c) optical gauges
d) plug gauges

69. Poor fusion in a welded is due to
a) high welding speed
b) dirty metal surface
c) improper current
d) lock of flux

70. Counterboring is the operation of
a) enlarging the end of a hole cylindrically
b) cone-shaped enlargement of the end of a hole
c) smoothing and squaring the surface around a hole
d) sizing and finishing a hole

71. Research questions are crucial because they will
a) guide your decisions about what data to collect and from where
b) help you decide which research area interests you
c) ensure that your findings have external validity
d) prevent you from thinking about research strategies

72. A cross-sectional research design
a) allows for data collection over a substantial period of time
b) is commonly used for collection of qualitative data
c) allows for data in connection with two or more variables to be collected
d) is typically strong in internal validity

73. **The 'Hawthorne Effect' refers to**
a) the impact of heat and light on worker productivity
b) the development of the 'human relations' approach to the study of work
c) the researcher creating a bias in the data through participation in the research situation
d) the psychological effect of falling into a bush

74. **Why do you need to review the existing literature?**
a) to give your dissertation a proper academic appearance, with lots of references
b) because without it, you could never reach the required word-count
c) to find out what is already known about your area of interest
d) to help in your general studying

75. To read critically means
a) taking an opposing point of view to the ideas and opinions expressed
b) skimming through the material because most of it is just padding
c) evaluating what you read in terms of your own research questions
d) being willing to criticize what you read

76. A systematic literature review is

a) one which starts in your own library, then goes to on-line databases and, finally, to the internet
b) a replicable, scientific and transparent process
c) one which gives equal attention to the principal contributors to the area
d) a responsible, professional process of time-management for research

77. What is meta-analysis?

a) a technique for correcting the errors in individual studies within a survey of a large number of studies, to demonstrate the effect of a particular variable
b) a process of secondary-data gathering to assemble all the possibilities for a variable's effects
c) a substitute for original research, which is justified by constraints of time or money
d) a specialized step in a computer software program (e.g. SPSS)

78. When accessing the internet, which of these steps is the most essential?

a) recording the full URL
b) noting the access dates
c) downloading material to be referenced
d) they are all equally important

79. According to the Harvard referencing convention, pick out the correct version of showing this book in a bibliography

a) Bryman, A. and Bell, E. (2007) Business Research Methods, 2nd edition, Oxford: Oxford University Press
b) Bryman and Bell (2007, second edition), Oxford University Press
c) Bryman, Alan and Emma Bell, Business Research Methods (2007: OUP)
d) Bryman, A. and Bell, E. Business Research Methods (2007)

80. Which of the following statements about plagiarism is most accurate?

a) it is so easy to "copy and paste" from the internet that everyone does it nowadays. If a proper reference is given, where is the harm in that?
b) how can we say for sure where our own ideas come from exactly? If we tried to give a reference for everything we could never hope to succeed
c) any suggestion that we have written what another actually wrote is morally wrong. Anyway, the whole point of a literature review is to show what we have read and what we thought about it
d) plagiarism is such an awful crime that those found guilty should be obliged to wear a scarlet "P" on their clothing

81. How will a researcher usually prevent a significant sampling error?

a) interview all respondents in advance
b) issue questionnaires to the entire sampling frame
c) put all the names in a hat
d) use probability sampling

82. If an organization has 12,000 employees and the researcher is able to interview 250, the probability of inclusion in the sample is?

a) 1 in 96
b) 1 in 20
c) 1 in 48
d) 1 in 250

83. Which of the following is not something a researcher will have to consider when thinking about their sample size?

a) time and cost
b) non-response
c) length of questionnaire
d) heterogeneity of population

84. What is the difference between a bar chart and a histogram?

a) a histogram does not show the entire range of scores in a distribution
b) bar charts are circular, whereas histograms are square
c) there are no gaps between the bars on a histogram
d) bar charts represent numbers, whereas histograms represent percentages

85. What is meant by a 'spurious' relationship between two variables?

a) one that is so ridiculously illogical it cannot possibly be true
b) an apparent relationship that is so curious it demands further attention
c) a relationship that appears to be true because each variable is related to a third one
d) one that produces a perfect negative correlation on a scatter diagram

86. What is the difference between synchronous and asynchronous methods of data collection?

a) synchronous methods mean all data is collected at once, whereas asynchronous methods mean that data is collected individually
b) synchronous methods mean data is collected in real time, whereas asynchronous methods mean data collection is not immediate
c) synchronous methods are quantitative, whereas asynchronous methods are qualitative
d) synchronous methods use email as their mode of communication, whereas asynchronous methods use chat rooms

87. Which of the following is not a disadvantage of online surveys when compared to postal surveys?

a) typically lower response rates
b) more unanswered questions
c) confidentiality and anonymity issues
d) multiple replies

88. Which of the following is a way in which qualitative research can facilitate quantitative research?

a) by using knowledge of context to inform survey design
b) by allowing for more representative sampling
c) by negating the need to pilot a questionnaire
d) all of the above

89. What is an implication of peer review on writing journal articles?

a) it is likely the article will have been revised from its original form
b) it means that the first draft can be a basic synopsis of the main arguments
c) it means the article should cite those who will review it
d) it is important to make friends in the academic community

90. Why might an author use string references?

a) to denote the chronological development of the field of study.
b) to group authors according to indicate a theoretical association.
c) to measure the volume of existing material in the field of study.
d) all of the above.