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ENTRANCE EXAMINATION FOR ADMISSION, MAY 2010.

Ph.D. (MECHANICAL ENGINEERING)

COURSE CODE : 139

Register Number :

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(with date)

COURSE CODE : 139

Time : 2 Hours Max : 400 Marks

Instructions to Candidates :

1. Write your Register Number within the box provided on the top of this page and fill in the page 1 of the answer sheet using pen.
2. Do not write your name anywhere in this booklet or answer sheet. Violation of this entails disqualification.
3. Read each question carefully and shade the relevant answer (A) or (B) or (C) or (D) in the relevant box of the ANSWER SHEET using HB pencil.
4. Avoid blind guessing. A wrong answer will fetch you –1 mark and the correct answer will fetch 4 marks.
5. Do not write anything in the question paper. Use the white sheets attached at the end for rough works.
6. Do not open the question paper until the start signal is given.
7. Do not attempt to answer after stop signal is given. Any such attempt will disqualify your candidature.
8. On stop signal, keep the question paper and the answer sheet on your table and wait for the invigilator to collect them.
9. Use of Calculators, Tables, etc. are prohibited.

1. Hooke's law holds good upto
   (A) yield point
   (B) proportional limit
   (C) breaking point
   (D) plastic limit

2. Material which exhibit the same elastic properties in all directions are called
   (A) homogeneous
   (B) inelastic
   (C) isotropic
   (D) isentropic

3. Moment of inertia of an area is always least with respect to
   (A) bottom most axis
   (B) radius of gyration
   (C) central axis
   (D) centroidal axis

4. The design of a thin cylindrical shells is based on
   (A) hoop stress
   (B) longitudinal stress
   (C) volumetric stress
   (D) none of the above

5. During the tensile test of a glass rod the nature of the stress-strain curve is
   (A) straight and dropping
   (B) sudden breaking
   (C) straight line
   (D) parabolic

6. The point of contra-flexure occurs only in
   (A) overhanging beam
   (B) cantilever beam
   (C) simply supported beam
   (D) continuous beam

7. Torsional rigidity of a sold circular shaft of diameter 'd' is proportional to
   (A) d (B) d^2 (C) d^3 (D) d^4

8. If a coil is cut into two halves, the stiffness of cut-coils will be
   (A) same
   (B) half
   (C) double
   (D) none of the above

9. Shear stress theory is applied to
   (A) ductile materials
   (B) brittle materials
   (C) elastic materials
   (D) all of the above

10. In V-belt drive, belt touches
   (A) at the bottom
   (B) at sides only
   (C) both at the bottom and sides
   (D) none of the above

11. Types of gear used in transmission for non-parallel and non-intersecting shafts are
(A) worm gears (B) helical gears
(C) hypoid gears (D) herringbone gears

12. Which of the following alloys does not contain tin?
(A) phosphor bronze (B) fusible metal
(C) gun metal (D) white metal

13. Constantan, an alloy used in thermocouple, is an alloy of
(A) copper and tin (B) copper and iron
(C) copper and zinc (D) copper and nickel

14. Lime stone is added in blast furnace to flux
(A) MnO_2 (B) SiO_2 (C) $KMnO_2$ (D) Carbon

15. High speed steel belongs to the category of
(A) low-carbon steel (B) medium carbon steel
(C) high carbon steel (D) alloy steel

16. Pick up the wrong property of austenite
(A) softness (B) malleability
(C) magnetism (D) ductility

17. Which of the following is an amorphous material?
(A) Mica (B) Lead (C) Plastic (D) Glass

18. Haematite is the mineral form of
(A) aluminum oxide (B) copper oxide
(C) iron oxide (D) gold

19. The binding material for cementite carbide tools is
(A) nickel (B) cobalt
(C) chromium (D) molybdenum

20. Investment casting uses pattern made of
(A) wax (B) mercury (C) clay (D) special sand

21. Cores are used to

(A) make desired recess in castings (B) strengthen moulding sand

(C) support loose pieces (D) remove pattern easily

22. In sand moulding the bottom most part of the flask is called

(A) cope (B) cheek

(C) drag (D) none of the above

23. Cow dung is sometimes used in

(A) bench moulding (B) green sand moulding

(C) dry sand moulding (D) all of the above

24. Coining is the operation of

(A) piercing (B) cold extrusion

(C) cold forging (D) hot forging

25. Steel balls are manufactured by

(A) machining (B) sintering

(C) casting (D) cold heading

26. Electrode gets consumed in the following welding process

(A) Arc (B) Gas (C) Thermit (D) TIG

27. The carburizing flame as compared to oxidizing flame is

(A) less luminous (B) more luminous

(C) equally luminous (D) unpredictable

28. The gas used in TIG welding process is

(A) hydrogen (B) helium (C) acetylene (D) argon

29. Centering can be done most accurately on

(A) collet chuck (B) three jaw chuck

(C) four jaw chuck (D) all of the above

30. Carbide tips are fixed to the shanks of cutting tools by

(A) brazing (B) soldering (C) sintering (D) welding

31. The process of trimming is associated with

(A) forging (B) electroplating

(C) machining (D) press work

32. The process of improving cutting action of grinding wheel is called

(A) clearing operation (B) facing operation

(C) dressing operation (D) turning operation

33. Dovetail milling cutter falls under the category

(A) plain milling cutter (B) side milling cutter

(C) end milling cutter (D) none of the above

34. Kerosene is a good cutting fluid to use when drilling

(A) aluminium (B) brass (C) bronze (D) cast iron

35. The process used for producing fine surface finish is

(A) broaching (B) tumbling (C) sintering (D) swaging

36. A feeler gauge is used to check

(A) surface roughness (B) unsymmetrical shape

(C) thickness of clearance (D) none of the above

37. Optical flats are made of

(A) silicon (B) glass (C) plastic (D) quartz

38. The device that can be used to scribe lines parallel to the edges of a part is

(A) divider (B) screw gauge

(C) combination set (D) hermaphrodite caliper

39. A surface gauge is used for

(A) leveling the surface plate (B) laying out the work accurately

(C) finding flatness of the surfaces (D) checking the surface finish

40. Millimeter scale in a micrometer is marked on

(A) anvil (B) thimble (C) barrel (D) ratchet

41. A perfect gas

(A) is a perfect fluid
(B) is incompressible
(C) does not have viscosity
(D) does not really exist

42. Absolute pressure is measured by

(A) a Bourdon gauge
(B) an aneroid barometer
(C) a differential manometer
(D) a hook gauge

43. A floating body displaces a volume of liquid equal to

(A) its own volume
(B) its submerged weight
(C) its own weight
(D) all of the above

44. When a block of ice floating on water in a container melts the level of water in the container

(A) falls
(B) rises
(C) first falls and then rises
(D) remains the same

45. The difference between the total head line and the hydraulic grade line represents

(A) the velocity head
(B) the piezometric head
(C) the pressure head
(D) the elevation head

46. The continuity equation in fluid mechanics is a mathematical statement embodying the principle of

(A) conservation of energy
(B) conservation of mass
(C) conservation of momentum
(D) none of the above

47. A static tube is used to measure

(A) the velocity
(B) the total head
(C) the datum head
(D) undisturbed fluid pressure

48. Kaplan turbine is

(A) an axial flow turbine
(B) a radial flow turbine
(C) an impulse turbine
(D) none of the above

49. A fast centrifugal pump impeller will have

(A) radial blades
(B) forward facing blades
(C) backward facing blades
(D) propeller type blades

50. In a hydraulic pump, the term NPSH stands for

(A) net pressure static head
(B) net positive suction head
(C) net pressure suction head
(D) none of the above

51. No liquid can exist as liquid at

(A) –273°C
(B) vacuum
(C) in space
(D) zero pressure

52. A thermodynamic system in which both energy and mass do not cross its boundaries is known as

(A) closed system
(B) open system
(C) isolated system
(D) none of the above

53. Work in a free expansion process is

(A) positive
(B) negative
(C) zero
(D) unpredictable

54. Heat and work are

(A) point functions
(B) path functions
(C) system properties
(D) none of the above

55. Total heat of a substance is also known as

(A) internal energy
(B) enthalpy
(C) entropy
(D) heat capacity

56. Thermal efficiency will be maximum for

(A) reversible engine
(B) irreversible engine
(C) new engine
(D) all of the above

57. In a Carnot engine heat is supplied at

(A) constant entropy
(B) constant volume
(C) constant pressure
(D) constant temperature

58. A diathermic wall is one which

(A) does not exit
(B) prevents thermal interaction
(C) permits thermal interaction
(D) none of the above

59. During an isothermal process the internal energy of gas molecules
(A) increases (B) decreases
(C) remains constant (D) remains unpredictable

60. The principle of measurement of temperature is based on
(A) zeroth law of thermodynamics (B) first law of thermodynamics
(C) second law of thermodynamics (D) third law of thermodynamics

61. Mass number of an element represents
(A) mass of electrons (B) mass of protons
(C) mass of neutrons (D) none of the above

62. Isotopes of an element have same
(A) mass number (B) atomic number
(C) chemical properties (D) none of the above

63. The process during which a heavy nucleus splits into many light nuclei is known as
(A) disintegration (B) fission
(C) fusion (D) none of the above

64. The function of control rods in a nuclear reactor is to control
(A) temperature (B) radioactive pollution
(C) absorption of neutron (D) fuel consumption

65. The risk of radioactive hazard is greatest in the turbine with following reactor
(A) pressurized water reactor (B) boiling water reactor
(C) gas cooled reactor (D) all of the above

66. The air-fuel ratio in a petrol engine is controlled by
(A) fuel pump (B) governor (C) carburettor (D) injector

67. In diesel engine the compression ratio in comparison to expansion ratio is
(A) same (B) less (C) more (D) unpredictable

68. The theoretically correct air-fuel ratio for petrol engine is of the order of
(A) 6 : 1 (B) 10 : 1 (C) 12 : 1 (D) 15 : 1

69. The top piston ring nearer to the piston crown is known as

(A) compression ring (B) oil ring

(C) scrapper ring (D) leading ring

70. Octane number of iso-octane is about

(A) 40 (B) 60 (C) 80 (D) 100

71. All the four operations in a two stroke engine are performed in the following number of revolutions of crank shaft

(A) one (B) two (C) four (D) eight

72. Connecting rods are generally forged from

(A) cast iron (B) carbon steel

(C) stainless steel (D) aluminium alloy

73. The most efficient method of compressing air is to compress it

(A) adiabatically (B) isentropically

(C) isothermally (D) isochorically

74. A compressor at high altitude will draw

(A) more power (B) less power (C) same power (D) no power

75. The optimum intermediate pressure in two stage compressor is computed using suction and delivery pressures as

(A) geometric mean of the two pressures

(B) average of the two pressures

(C) one fourth of sum of the two pressures

(D) none of the above

76. The advantage of multistage compression over single stage compression is

(A) lower power per unit of air delivered (B) higher volumetric ratio

(C) decreased discharge temperature (D) all of the above

77. Separators are generally installed in compressors

(A) after the intercooler (B) before the intercooler

(C) before the first stage suction (D) before the receiver tank

78. Gas turbine works on

(A) Carnot cycle (B) Brayton cycle

(C) Rankine cycle (D) Diesel cycle

79. Temperature of gases at the end of compression as compared to exhaust gases in a gas turbine is

(A) equal (B) higher (C) lower (D) unpredictable

80. The fuel consumption in a gas turbine is accounted for by

(A) lower heating value (B) higher heating value

(C) lower calorific value (D) all of the above

81. Mechanical efficiency of gas turbines as compared to IC engines is

(A) same (B) higher (C) lower (D) unpredictable

82. In jet aircraft engines, the products of combustion after passing through the gas turbine are discharge into

(A) atmosphere (B) back to the compressor

(C) discharge nozzle (D) none of the above

83. Propulsive efficiency is defined as the ratio of

(A) engine output to propulsive power (B) propulsive power to fuel input

(C) thrust power to fuel input (D) thrust power to propulsive power

84. When the pressure increases the latent heat of steam

(A) increases (B) decreases

(C) remains same (D) becomes unpredictable

85. The following is a boiler mounting

(A) feed check valve (B) feed water pump

(C) air pre-heater (D) economizer

86. In a thermal power plant balanced draught refers to system or systems having

(A) forced draught (B) induced draught

(C) forced and induced draughts (D) all of the above

87. For the same diameter and thickness of tube, a water tube boiler when compared with a fire tube boiler has

(A) less heating surface
(B) more heating surface
(C) equal heating surface
(D) none of the above

88. Curtis turbine is basically

(A) a simple impulse turbine
(B) a reaction turbine
(C) a velocity compounded impulse turbine
(D) a pressure compounded impulse turbine

89. Steam turbine works on

(A) Atkinson cycle
(B) Bell-Coleman cycle
(C) Joule cycle
(D) None of the above

90. Air from a condenser is extracted from

(A) the coldest zone in the condenser
(B) the hottest zone in the condenser
(C) the centre of the condenser
(D) anywhere in the condenser

91. According to Dalton's law, volumes of air and steam occupied at their partial pressures and at the same temperature are

(A) same
(B) different
(C) zero
(D) unpredictable

92. From the point of view of pollution control, cyclone separator when compared with electrostatic precipitator is

(A) more effective
(B) less effective
(C) same effective
(D) none of the above

93. One ton of refrigeration is equal to about

(A) 1.5 kW (B) 2.5 kW (C) 3.5 kW (D) 5.5 kW

94. The COP of a domestic refrigerator is

(A) more than 1
(B) less than 1
(C) equal to 1
(D) unpredictable

95. For unsaturated air, wet bulb temperature is

(A) less than dew point
(B) more than dew point
(C) less than dry bulb temperature
(D) unpredictable

96. For NPN transistor, negative voltage is required at the

(A) base
(B) emitter
(C) collector
(D) all of the above

97. The substitution of machinery that has sensing and control devices for human labour is best described by the term

(A) computer aided manufacturing
(B) computer integrated manufacturing
(C) automation
(D) none of the above

98. The benefit of flexible manufacturing systems (FMS) include

(A) reduced labour costs
(B) higher flexibility than automation
(C) quick change over from part to part
(D) all of the above

99. In computer aided manufacturing, DNC stands for

(A) direct numerical control
(B) digital number control
(C) digital number code
(D) none of the above

100. Flexible design and manufacturing is known as

(A) computer aided manufacturing
(B) computer integrated manufacturing
(C) computer aided design
(D) all of the above