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Question Booklet No.

QUESTION BOOKLET

FOREMAN INSTRUCTOR

Booklet Series

A

Roll No. | | | | | |

(Enter your Roll number in the above space)

Time Allowed : 2 Hours **Maximum Marks : 100**

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1. A cylindrical elastic body subjected to pure torsion about its axis develops

[A] tensile stress in a direction at 45° to the axis

[B] no tensile or compressive stress

[C] maximum shear stress along the axis of the shaft

[D] maximum shear stress at 45° to the axis

2. An elastic body is subjected to a tensile stress X in a particular direction and a compressive stress Y in its perpendicular direction. X and Y are unequal in magnitude. On the plane of maximum shear stress in the body, there will be

[A] no normal stress

[B] also the maximum normal stress

[C] minimum normal stress

[D] both normal stress and shear stress

3. Two beams, one having square cross-section and another circular cross-section, are subjected to the same amount of bending moment. If the cross-sectional area as well as the material of both beams are the same, then

[A] maximum bending stress developed in both the beams is the same

[B] the circular beam experiences more bending stress than the square one

[C] the square beam experiences more bending stress than the circular one

[D] the beams will experience same deformation

4. If the length of a column is doubled, the critical load becomes

[A] $\frac{1}{2}$ of the original value

[B] $\frac{1}{4}$ of the original value

[C] $\frac{1}{8}$ of the original value

[D] $\frac{1}{16}$ of the original value

5. The SI units of linear velocity and angular velocity respectively are

[A] m/sec, rad/sec

[B] cm/sec, rad/sec

[C] mm/sec, r.p.m.

[D] ft/sec, angle/sec

6. Tooth interference in an external involute spur gear pair can be reduced by

[A] decreasing centre distance between gear pair

[B] decreasing module

[C] decreasing pressure angle

[D] increasing number of gear teeth

7. The balancing of rotating and reciprocating parts of an engine is necessary when it runs at

[A] slow speed

[B] medium speed

[C] high speed

[D] very slow speed

8. In case of worm and worm-wheel, the maximum efficiency is obtained when

[A] worm is driver

[B] worm-wheel is driver

[C] either the worm or worm-wheel is driver

[D] Depends on other factors

9. In the design of shafts made of ductile materials subjected to twisting moment and bending moment, the recommended theory of failure is

[A] maximum principal stress theory

[B] maximum principal strain theory

[C] maximum shear stress theory

[D] maximum strain energy theory

10. Stress concentration in a machine component of a ductile material is not as harmful as it is in a brittle material, because

[A] in ductile material, local yielding may distribute stress concentration

[B] ductile material has larger Young's modulus

[C] Poisson's ratio is larger in ductile materials

[D] modulus of rigidity is larger in ductile materials

11. Within a boundary layer for a steady incompressible flow, the Bernoulli's equation

[A] holds because the flow is steady

[B] holds because the flow is incompressible

[C] holds because the flow is transitional

[D] does not hold because the flow is frictional

12. The normal stress is the same in all directions at a point in a fluid, if

[A] fluid is frictionless

[B] fluid is frictionless and incompressible

[C] fluid is incompressible

[D] fluid has zero viscosity

13. An incompressible flow is one, in which

[A] fluid temperature is constant

[B] fluid density is constant

[C] fluid is non-viscous

[D] fluid compressibility is non-zero

14. For a given heat flow and for the same thickness, the temperature drop across the material will be maximum for

[A] copper

[B] steel

[C] glass wool

[D] refractory brick

15. As the temperature increases, the thermal conductivity of a gas

[A] increases

[B] decreases

[C] remains constant

[D] increases up to a certain temperature and then decreases

16. The specific heat of an ideal gas depends on its

[A] temperature

[B] pressure

[C] volume

[D] molecular weight and structure

17. An isolated thermodynamic system executes a process. Choose the correct statement(s) from the following :

[A] No heat is transferred

[B] No work is done

[C] No mass flows across the boundary of the system

[D] All of the above

18. A balloon containing an ideal gas is initially kept in an evacuated and insulated room; the balloon ruptures and the gas fills up the entire room. Which one of the following statements is ***true*** at the end of the above process?

[A] The internal energy of the gas decreases from its initial value, but the enthalpy remains constant

[B] The internal energy of the gas increases from its initial value, but the enthalpy remains constant

[C] Both internal energy and enthalpy of the gas remain constant

[D] Both internal energy and enthalpy of the gas increase

19. An insulated rigid vessel contains a mixture of fuel and air. The mixture is ignited by a minute spark. The contents of the vessel experience

[A] increase in temperature, pressure and energy

[B] decrease in temperature, pressure and energy

[C] increase in temperature and pressure but no change in energy

[D] increase in temperature and pressure but decrease in energy

20. Global warming is caused by

[A] ozone

[B] carbon dioxide

[C] carbon

[D] nitrogen monoxide

21. For air with a relative humidity of 80%, the

[A] dry bulb temperature is less than the wet bulb temperature

[B] dew point temperature is less than the wet bulb temperature

[C] dew point and wet bulb temperatures are equal

[D] dry bulb and dew point temperatures are equal

22. Clearance volume of a reciprocating compressor is 100 ml and the volume of the cylinder at bottom dead center is 1·0 litre. The clearance ratio of the compressor is

[A] 1/11

[B] 1/10

[C] 1/9

[D] 1/1·1

23. Dew point temperature is the temperature at which condensation begins when the air is cooled at constant

[A] volume

[B] entropy

[C] pressure

[D] enthalpy

24. Hardness of steel greatly improves with

[A] annealing

[B] cyaniding

[C] normalizing

[D] tempering

25. Hardness of green sand mould increases with

[A] increase in moisture content beyond 6 percent

[B] increase in permeability

[C] decrease in permeability

[D] increase in both moisture content and permeability

26. Pearlite consists of

[A] 6·67% C and 93·33% ferrite

[B] 13% Fe and 87% cementite

[C] 13% C and 87% ferrite

[D] 13% cementite and 87% ferrite

27. Hot tears in casting are caused by

[A] excess mould hardness

[B] high sand permeability

[C] low green strength

[D] high moisture content

28. Largest amount of shrinkage occurs during

[A] pouring of molten metal

[B] molten metal passing through gates

[C] cooling of casting

[D] pattern making

29. The major difficulty during welding of aluminium is due to its

[A] high tendency of oxidation

[B] high thermal conductivity

[C] low melting point

[D] low density

30. In turning operation, the feed rate could be doubled to increase the metal removal rate. To keep the same level of surface finish, the nose radius of the tool has to be

[A] doubled

[B] halved

[C] multiplied by 4 times

[D] kept unchanged

31. The ideal cutting fluid for low speed machining of metals should be one, which

[A] removes the heat faster from the cutting zone

[B] forms a coating on the cutting tools by chemical reaction

[C] forms a low shear strength film of work material at the tool chip interface

[D] serves as a dielectric, minimizing thereby reactions due to EMF at the interface

32. The heat generated in metal cutting is dissipated in different proportions into environment, tool, chip and workpiece. The correct order of this proportion in decreasing magnitude is (no cutting fluid is used)

[A] tool, work, chip, environment

[B] work, tool, chip, environment

[C] tool, chip, environment, work

[D] chip, tool, work, environment

33. Reaming is primarily used for achieving

[A] higher MRR

[B] improved dimensional tolerance

[C] fine surface finish

[D] improved positional tolerance

34. In an engineering drawing, one finds the designation of 20G7f8. The position of tolerance of the hole is indicated by

[A] letter G

[B] letter f

[C] number 7

[D] number 8

35. Allowance in limits and fits refers to

[A] maximum clearance between shaft and hole

[B] minimum clearance between shaft and hole

[C] difference between maximum and minimum size of hole

[D] difference between maximum and minimum size of shaft

36. With reference to NC machine, which of the following statements is ***wrong***?

[A] Both closed-loop and open-loop control systems are used

[B] Paper tapes, floppy drives and cassettes are used for data storage

[C] Digitisers may be used as interactive input devices

[D] Post-processor is an item of hardware

37. In computer aided drafting practice, an arc is defined by

[A] two endpoints only

[B] centre and radius

[C] radius and one endpoint

[D] two endpoints and centre

38. During the execution of a CNC part program block

N020 G02 X45·0 Y25·0 R5·0

The type of tool motion will be

[A] circular interpolation—clockwise

[B] circular interpolation—counter-clockwise

[C] linear interpolation

[D] rapid feed

39. In a 2-D CAD package, clockwise circular arc of radius 5, specified from point P_1 (15,10) to P_2 (10,15) will have its centre at

[A] (10,10)

[B] (15,10)

[C] (15,15)

[D] (10,15)

40. A DC servomotor is directly driving an NC table. The pitch of the lead screw of the table is 5 mm. The motor rotates at 100 r.p.m. for an applied voltage of 10 V. If the voltage speed characteristic of the motor is linear, the applied voltage for a table speed of 3 m/min is equal to

[A] 30 V

[B] 33 V

[C] 60 V

[D] 50 V

41. Production Flow Analysis (PFA) is a method of identifying part families that uses data from

[A] engineering drawings

[B] production schedule

[C] bill of materials

[D] route sheets

42. A welding operation is time-studied during which an operator was pace-rated as 120%. The operator took, on an average, 8 minutes for producing the weld-joint. If a total of 10 % allowances are allowed for this operation, the expected standard production rate of the weld-joint (in units per 8-hour day) is

[A] 45

[B] 50

[C] 55

[D] 60

43. Vehicle manufacturing assembly line is an example of

[A] product layout

[B] process layout

[C] manual layout

[D] fixed layout

44. The word 'Kanban' is associated with

[A] economic order quantity

[B] just-in-time production

[C] capacity planning

[D] product design

45. The point through which the whole weight of the body acts, irrespective of its position, is known as

[A] moment of inertia

[B] centre of gravity

[C] centre of mass

[D] centre of percussion

46. When a cantilever beam is loaded with concentrated loads, the bending moment diagram will be a/an

[A] horizontal straight line

[B] parabolic curve

[C] vertical straight line

[D] inclined straight line

47. When a column is subjected to an eccentric load, the stress induced in the column will be

[A] direct stress only

[B] shear stress only

[C] bending stress only

[D] direct stress and bending stress both

48. The property of a liquid which offers resistance to the movement of one layer of liquid over another adjacent layer of liquid is called

[A] compressibility

[B] surface tension

[C] viscosity

[D] capillarity

49. The metacentric height of two floating bodies *A* and *B* are 1 m and 1·5 m respectively. Select the **correct** statement.

[A] The bodies *A* and *B* have equal stability

[B] The body *A* is more stable than body *B*

[C] The body *B* is more stable than body *A*

[D] The bodies *A* and *B* are unstable

50. The total energy of a liquid particle in motion is equal to

[A] pressure energy + kinetic energy + potential energy

[B] pressure energy – kinetic energy + potential energy

[C] potential energy – pressure energy + kinetic energy

[D] kinetic energy – pressure energy + potential energy

51. A screw will be self-locking, if

[A] friction angle is less than helix angle

[B] friction angle is more than helix angle

[C] friction angle is equal to helix angle

[D] efficiency of screw is 100%

52. A steam pipe is to be lined with two layers of insulating materials of different thermal conductivities. For the minimum heat transfer

[A] the better insulation must be put inside

[B] the better insulation must be put outside

[C] one could place either insulation on either side

[D] one should take into account the steam temperature before deciding as to which insulation is put where

53. The increase in entropy of a system represents

[A] increase in availability of energy

[B] increase in temperature

[C] decrease in pressure

[D] degradation of energy

54. One reversible heat engine operates between 1600 K and T_2 K and another reversible heat engine operates between T_2 K and 400 K. If both the engines have the same heat input and output, then temperature T_2 is equal to

[A] 800 K

[B] 1000 K

[C] 1200 K

[D] 1400 K

55. For constant pressure and heat input, the air standard efficiency of gas power cycle is in the order—

[A] dual cycle, Diesel cycle, Otto cycle

[B] Otto cycle, Diesel cycle, dual cycle

[C] dual cycle, Otto cycle, Diesel cycle

[D] Diesel cycle, Otto cycle, dual cycle

56. Stoichiometric ratio is

[A] chemically correct air-fuel ratio by weight

[B] chemically correct air-fuel ratio by volume

[C] actual air-fuel ratio for maximum efficiency

[D] equal to air and fuel ratio for maximum efficiency

57. The fuel valve in a four-stroke cycle Diesel engine

[A] opens at 15° after top dead centre and closes at 20° before bottom dead centre

[B] opens at 15° before top dead centre and closes at 20% after top dead centre

[C] opens at top dead centre and closes at bottom dead centre

[D] may open and close anywhere

58. A three-high rolling mill consists of three rolls placed one above the other. Which of the following statements is **correct**?

[A] The upper and middle rolls rotate in the same direction whereas the bottom roll rotates in opposite direction

[B] The upper and bottom rolls rotate in the same direction where as the middle roll rotates in opposite direction

[C] The bottom and middle rolls rotate in the same direction

[D] The upper and middle rolls rotate in the same direction

59. In a _____, the molten metal is poured and allowed to solidify while the mould is revolving.

[A] die-casting method

[B] slush casting method

[C] permanent mould casting method

[D] centrifugal casting method

60. The current in electric resistance welding can be regulated by

[A] varying the input supply

[B] changing the primary turns of the transformer

[C] changing the secondary terms of the transformer

[D] varying the output supply

61. A hacksaw blade cuts on the

[A] forward stoke

[B] return stroke

[C] both forward and return strokes

[D] Cutting depends upon the direction of force

62. The high cutting speed and large rake angle of the tool will result in the formation of

[A] continuous chips

[B] discontinuous chips

[C] continuous chips with built-up edge

[D] no chips

63. Fixture is used

[A] for holding and guiding the tool in drilling, reaming or tapping operations

[B] for holding the work in milling, grinding, planning or turning operations

[C] to check the accuracy of work-piece

[D] for holding and locating a work-piece and to guide and control one or more cutting tools

64. The process of removing metal by a cutter which is rotated against the direction of travel of workpiece, is called

[A] up milling

[B] down milling

[C] face milling

[D] end milling

65. Work study is mainly aimed at

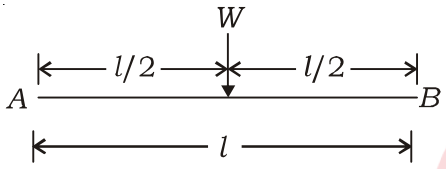
[A] determining the most efficient method of performing a job

[B] establishing the minimum time of completion of a job

[C] developing the standard method and standard time of a job

[D] economizing the motions involved on the part of the worker while performing a job

66. For a beam, as shown in the figure below, when the load W is applied in the centre of the beam, the maximum deflection is



[A] $\frac{W l^3}{48 EI}$

[B] $\frac{W l^3}{54 EI}$

[C] $\frac{5W l^3}{384 EI}$

[D] $\frac{W l^3}{384 EI}$

67. Quick return mechanism is an inversion of

[A] four-bar chain

[B] single-slider crank chain

[C] double-slider crank chain

[D] crossed slider crank chain

68. In a cam mechanism with reciprocating roller follower, the follower has a constant acceleration in the case of

[A] cycloidal motion

[B] simple harmonic motion

[C] parabolic motion

[D] 3-4-5 polynomial motion

69. A transmission shaft subjected to bending loads only must be designed on the basis of

[A] maximum normal stress theory

[B] maximum shear stress theory

[C] maximum normal stress and maximum shear stress theory

[D] fatigue strength

70. Backlash in spur gear is the

[A] difference between the dedendum of the gear and addendum of the mating gear

[B] difference between the tooth space of the gear and the tooth thickness of the mating gear measured on the pitch circle

[C] intentional extension of centre distance between two gears

[D] None of the above

71. Steady state fluid flow occurs when

[A] pressure does not change along the flow

[B] velocity does not change

[C] conditions change gradually with time

[D] conditions do not change with time at any point

72. The resultant upward pressure of fluid on a floating body is equal to the weight of fluid displaced by the body. This definition is according to

[A] buoyancy

[B] equilibrium of a floating body

[C] Archimedes' principle

[D] Bernoulli's theorem

73. The pressure of the liquid flowing through the divergent portion of a venturi meter

[A] remains constant

[B] increases

[C] decreases

[D] depends on mass of the fluid

74. Which of the following is an example of impulse turbine?

[A] Fancies turbine

[B] Kaplan turbine

[C] Pelton turbine

[D] Propeller turbine

75. The product of mechanical efficiency and hydraulic efficiency is known as

[A] mechanical efficiency

[B] volumetric efficiency

[C] hydraulic efficiency

[D] overall efficiency

76. The wavelength of the radiation emitted by a body depends upon

[A] the nature of its surface

[B] the area of its surface

[C] the temperature of its surface

[D] All of the above

77. Emissive power of a body depends upon

[A] wavelength

[B] temperature

[C] physical nature

[D] All of the above

78. In a shell and tube exchanger, baffles are provided on the shell side to

[A] prevent the stagnation of shell side fluid

[B] improve heat transfer

[C] provide support for the tubes

[D] All of the above

79. The ratio of specific heat at constant pressure (C_p) and specific heat at constant volume (C_v) is

[A] equal to one

[B] greater than one

[C] less than one

[D] equal to zero

80. Which of the following is ***not*** a desirable property of a refrigerant?

[A] Low boiling point

[B] Good electrical conductivity

[C] Non-inflammable

[D] High latent heat

81. Which cast iron has modular or spheroidal graphite crystal structure?

[A] Ductile iron

[B] Wrought iron

[C] Gray iron

[D] White iron

82. The term 'bronze' is used to designate an alloy containing

[A] copper and zinc

[B] copper and aluminum

[C] copper and nickel

[D] copper and tin

83. The portion of the part to be machined in the casting is marked with _____ colour.

[A] black

[B] green

[C] red

[D] blue

84. Which of the following electrodes is used in tungsten inert gas welding process?

[A] Brass and bronze

[B] Consumable tungsten

[C] Non-consumable tungsten

[D] Aluminium

85. In which of the following methods, an electrolyte is used?

[A] Ultrasonic machining

[B] Electrochemical machining

[C] Abrasive jet machining

[D] Laser beam machining

86. Which of the following is a solid-state joining process?

[A] Gas tungsten arc welding

[B] Resistance spot welding

[C] Friction welding

[D] Submerged arc welding

87. The correct way of designating fit is

[A] H_8/g_7

[B] g_7/H_8

[C] $50H_8/g_7$

[D] $50H_8/50g_7$

88. In limits and fits system, basic shaft system is one whose

[A] lower deviation is zero

[B] upper deviation is zero

[C] minimum clearance is zero

[D] maximum clearance is zero

89. Integration of CAD and CAM systems is called

[A] CIM

[B] CAE

[C] LAN

[D] FMS

90. A-B-C analysis is used for

[A] CPM

[B] PERT

[C] inventory control

[D] job-shop scheduling

91. The Toyota production system is known for

[A] Poka Yoke

[B] 5S

[C] Kaizen

[D] Kanban

92. PERT analysis is based on

[A] optimistic time

[B] pessimistic time

[C] most likely time

[D] All of the above

93. In case of a comparator, measurement is done by

[A] Parkinson method

[B] direct method

[C] interchange method

[D] displacement method

94. Which of the following is ***not*** used for angle measurement?

[A] Angle plate

[B] Angle gauge

[C] Sine bar

[D] Bevel protector

95. In shell and tube heat exchanger, baffles are mainly used to

[A] increase the mixing of fluid

[B] increase the heat transfer area

[C] deflect the flow in desired direction

[D] reduce fouling of the tube surface

96. Heat and work are

[A] intensive properties

[B] extensive properties

[C] point functions

[D] path functions

97. Cold working of steel is defined as working

[A] at its recrystallization temperature

[B] above its recrystallization temperature

[C] below its recrystallization temperature

[D] at two-thirds of the melting temperature of the metal

98. If a particular Fe-C alloy contains less than 0·8% carbon, it is called

[A] high speed steel

[B] hypoeutectoid steel

[C] hypereutectoid steel

[D] cast iron

99. Which of the following arc welding processes ***does not*** use consumable electrode?

[A] GMAW

[B] GTAW

[C] SAW

[D] All of the above

100. Creep in belt derive is due to

[A] material of the pulley

[B] material of the belt

[C] larger size of the driver pulley

[D] uneven extensions and contractions due to varying tension

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