Booklet Serial No. : 0123

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TEST BOOKLET

AP(MECHANICAL ENGINEERING)(TE)-2014

Time Allowed : 2 Hours] [Maximum Marks : 100

All questions carry equal marks.

INSTRUCTIONS

1. Immediately after the commencement of the examination, you should check that test booklet does not have any unprinted or torn or missing pages or items, etc. If so, get it replaced by a complete test booklet.
2. Write your Roll Number only in the box provided alongside. Do not write anything else on the Test Booklet.
3. This Test Booklet contains **100** items (questions). Each item comprises four responses (answers). Choose only one response for each item which you consider the best.
4. After the candidate has read each item in the Test Booklet and decided which of the given responses is correct or the best, he has to mark the circle containing the letter of the selected response by blackening it completely with Black or Blue ball pen. In the following example, response "C" is so marked :

   Ⓐ Ⓑ ● Ⓓ

5. Do the encoding carefully as given in the illustrations. While encoding your particulars or marking the answers on answer sheet, you should blacken the circle corresponding to the choice in full and no part of the circle should be left unfilled.
6. You have to mark all your responses ONLY on the ANSWER SHEET separately given according to 'INSTRUCTIONS FOR CANDIDATES' already supplied to you. *Responses marked on the Test Booklet or in any paper other than the answer sheet shall not be examined.*
7. All items carry equal marks. Attempt all items. Your total marks will depend only on the number of correct responses marked by you in the Answer Sheet. There will be no negative marking.
8. Before you proceed to mark responses in the Answer Sheet fill in the particulars in the front portion of the Answer Sheet as per the instructions sent to you.
9. After you have completed the test, hand over the Answer Sheet to the Invigilator.

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P.T.O.

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1. The yield locus for von Mises yield criterion on π-plane is :

   (A) Circle (B) Ellipse

   (C) Hexagone (D) Circular cylinder

2. The Levy-von Mises equation is relation between the ratios of :

   (A) the components of strain and stress increments

   (B) the components of strain increment and deviatoric stress and shear stresses

   (C) plastic strain increments and deviatoric stress and shear stresses

   (D) the stress increments and plastic strain increments

3. The slip line theory is developed to analyse :

   (A) non-homogeneous plane stress deformation

   (B) homogeneous plane stress deformation

   (C) non-homogeneous plane strain deformation

   (D) homogeneous plane strain deformation

4. Which one is not useful to increase the fatigue resistance of a metal alloy ?

(A) Polish the surface to remove stress amplification sites

(B) Increase the number of internal defects (pores, etc.) by means of altering processing and fabrication techniques

(C) Modify the design to eliminate notches and sudden contour changes

(D) Harden the outer surface of the structure by case hardening (carburizing, nitriding) or shot peening

5. Creep becomes important at 0.4 Tm, Tm being the absolute melting temperature of the metal. For Al, 0.4 Tm :

(A) 373 K (B) 473 K

(C) 573 K (D) 673 K

6. The maximum number of phases that may be present for a ternary system assuming that pressure is held constant :

(A) 4 (B) 3

(C) 2 (D) 0

7. Which one is *not* the advantage of cold working ?

(A) A high quality surface finish

(B) The mechanical properties may be varied

(C) Close dimensional tolerances

(D) A loss of ductility

8. Percent elongation is an indicator of which mechanical property ?

(A) UTS (B) Yield strength

(C) Ductility (D) Resilience

9. Simple viscoplastic constitutive equations are used to model :

(A) stress relaxation (B) creep

(C) low cycle fatigue (D) ductile fracture

10. Which of the following is a measure of the pressure exerted by a state of stress ?

(A) Deviatoric stress (B) Hydrostatic stress

(C) von Mises stress (D) Cauchy stress

11. State of plane stress in x-y plane is accompanied by strains along :

(A) x, y and z-axes

(B) x and y-axes

(C) x and z-axes

(D) y and z-axes

12. The number of strain readings (using strain gauges) needed on a plane surface to determine the principal strains and their directions is :

(A) 4

(B) 3

(C) 2

(D) 1

13. The Grubler's criterion for determining the degrees of freedom (n) of a mechanism having plane motion is :

(A) $n = (l - 1) - j$

(B) $n = 3\ (l - 1) - 2j$

(C) $n = 2(l - 1) - 2j$

(D) $n = 4(l - 1) - 3j$

where l = No. of links and j = No. of binary joints.

14. The Coriolis component of acceleration is taken into account for :

(A) slider crank mechanism

(B) quick return mechanism

(C) four bar chain mechanism

(D) none of the above

15. The frictional torque transmitted in a flat pivot bearing, considering uniform wear, is :

(A) 1/2* μ.W.R. cosec α

(B) 2/3* μ.W.R. cosec α

(C) 3/4* μ.W.R. cosec α

(D) μ.W.R. cosec α

16. Absorption of energy into a flywheel is :

(A) at constant speed

(B) accompanied by increase of speed

(C) accompanied by decrease of speed

(D) not concerned with increase/decrease of speed

17. For static balancing :

(A) dynamic forces acting on the shaft must be zero

(B) net couple acting on the shaft due to dynamic forces must be zero

(C) both (A) and (B)

(D) none of the above

18. The secondary unbalanced force due to a reciprocating mass has :

(A) same frequency as of primary force

(B) twice the frequency as of primary force

(C) four times the frequency as of primary force

(D) none of the above

19. In an I.C. engine piston executes approximately S.H.M. if :

(A) length of connecting rod is very large in comparison of the length of crank

(B) length of crank is very large in comparison of the length of connecting rod

(C) length of connecting rod is equal to the length of crank

(D) piston does not execute S.H.M. at all

20. The supply of working fluid to the engine to suit the load conditions is controlled by :

(A) flywheel (B) governor

(C) throttle valve (D) all of these

21. Sensitiveness of a governor is defined as :

(A) range of speed/mean speed

(B) range of speed/2 × mean speed

(C) mean speed/range of speed

(D) 2 × mean speed/range of speed

22. If there are several unbalanced masses in a rotor in different planes, the minimum number of balancing masses required is/are :

(A) one

(B) two

(C) three

(D) four

23. SEQA effective Von Mises stress at phase difference of 90° is minimum when the ratio of torsion stress amplitude and bending stress amplitude is near to :

(A) 0.2

(B) 0.6

(C) 1

(D) 1.6

24. Which statement is true from the following statements for full journal bearing ?

(A) The temperature rise due to fluid shear increases on increase of Sommerfield number and it is more for longer bearing

(B) The temperature rise due to fluid shear increases on increase of Sommerfield number and it is less for longer bearing

(C) The temperature rise due to fluid shear decreases on increase of Sommerfield number and it is more for longer bearing

(D) The temperature rise due to fluid shear decreases on increase of Sommerfield number and it is less for longer bearing

25. RMS value of surface finish, R_q is obtained from the following equation :

(A) $R_q = \frac{1}{L}\int_0^L |y|\,dx$

(B) $R_q = \left[\frac{1}{L}\int_0^L |y|\,dx\right]^{1/2}$

(C) $R_q = \frac{1}{L}\int_0^L y^2\,dx$

(D) $R_q = \left[\frac{1}{L}\int_0^L y^2\,dx\right]^{1/2}$

26. In an involute pinion and gear system, the interference can be avoided by :

(A) decreasing number of teeth in pinion

(B) lowering the pressure angle

(C) taking long and short addendum system

(D) making the gears using form milling cutter

27. A solid steel shaft of diameter D shows a first critical speed of 1200 r.p.m. If the shaft were bored to make it hollow with an inside diameter $\frac{3}{4}$D, its critical speed would be :

(A) 1050 r.p.m.

(B) 1200 r.p.m.

(C) 1350 r.p.m.

(D) 1500 r.p.m.

28. If T is the life length of the system, then reliability of a system at time t, say R(t) is defined as :

(A) $R(t) = P(T > t)$

(B) $R(t) = P(T < t)$

(C) $R(t) = P(T = t)$

(D) $R(t) = 1 - P(T > t)$

29. Select the most suitable statement which is true :

(A) Newton's method allows slower convergence to the minimum point compared to steepest descent method

(B) Steepest descent direction at any point always passes through the minimum point

(C) In Genetic algorithm mutation probability is more than the crossover probability

(D) GRG method is a variable elimination method

30. In a tilted thrust bearing operating under hydrodynamic lubrication, the maximum pressure lies :

(A) at the exit point

(B) at the entry point

(C) in between the entry and exit point

(D) at entry or exit point depending on the direction of rotation of the shaft

31. The fatigue strength data is obtained from a rotating beam test. In this regard, loading is :

(A) random

(B) repeated

(C) fluctuating

(D) fully reversed

32. Six sigma company accepts the following number of defective products in an one million number of products :

(A) 3

(B) 6

(C) 30

(D) 60

33. For a rotating disk to be of uniform strength, the disk should have :

(A) uniform thickness with a hole at the centre

(B) uniform thickness without a hole at the centre

(C) larger tangential stress on outer radius of disk

(D) larger radial stress on outer radius of disk

34. The hoop stress in case of thick cylinders across the thickness :

(A) is uniformly distributed

(B) varies from maximum at the outer circumference to minimum at inner circumference

(C) varies from maximum at the inner circumference to minimum at outer circumference

(D) none of the above

35. If the shear force acting at every section of beam is of the same magnitude and of the same direction, then it represents :

(A) a simply supported beam with a concentrated load at the centre

(B) an overhung beam having equal overhung at both supports and carrying equal concentrated loads acting in the same direction at the free ends

(C) cantilever subjected to concentrated load at the free end

(D) simply supported beam having concentrated loads of equal magnitude and in the same direction acting at equal distance from supports

36. Which one of the following statements is true ?

(A) A flexure formula is used for pure bending only.

(B) A flexure formula is used for bending with shear only.

(C) A flexure formula is used for bending as well as for bending with shear

(D) None of the above statements are true

37. The no. of elastic constants in Triclinic material is :

(A) 36

(B) 9

(C) 2

(D) 21

38. The loss of strength in compression due to overloading is known as :

(A) hysteresis

(B) relaxation

(C) creep

(D) Bouschinger effect

39. Stress is a :

(A) Zero order tensor

(B) first order tensor

(C) second order tensor

(D) third order tensor

40. Which of the following assumptions is not made in curved beam ?

(A) Limit of proportionality is not exceeded

(B) Radial strain is not negligible

(C) Plane to transverse sections remain plane after bending

(D) Material considered is isotropic and obeys Hooke's law

41. The Poisson's ratio (μ) of bottle cork is :

(A) 0.5 (B) 0.3

(C) 0.25 (D) 0

42. Which one of the following is correct ?

(A) Pressure and temperature are independent during phase change

(B) An isothermal line is also a constant pressure line in the wet vapor region

(C) Entropy decreases during expansion

(D) The term dryness fraction is used to specify the fraction of mass of liquid in a mixture of liquid and vapor

43. With increase in pressure, the latent heat of the steam :

(A) remains the same (B) increases

(C) decreases (D) behaves unpredictably

44. When wet steam flows through a throttle valve and remains wet at exit :

(A) its temperature and quality increases

(B) its temperature decreases but quality increases

(C) its temperature increases but quality decreases

(D) its temperature and quality decreases

45. Constant pressure lines in the superheated region of the Mollier diagram will have :

(A) a positive slope

(B) a negative slope

(C) zero slope

(D) both positive and negative slope

46. Which one of the following statements is correct when saturation pressure of water vapor increases ?

(A) Saturation temperature decreases

(B) Enthalpy of evaporation decreases

(C) Enthalpy of evaporation increases

(D) Specific volume change of phase increases

47. For a pure substance, what are the numbers of the thermodynamic degree of freedom for saturated vapour and superheated vapour, respectively ?

(A) 1 and 1 (B) 1 and 2

(C) 2 and 1 (D) 2 and 2

48. Which one of the following is correct ? At critical point the enthalpy of vaporization is :

(A) dependent on temperature only

(B) maximum

(C) minimum

(D) zero

49. Water (c_p = 4 kJ/kgK) is fed a boiler at 30°C, the enthalpy of vaporization at atmospheric pressure in the boiler is 2400 kJ/kg; the steam coming from the boiler is 0.9% dry. What is the net heat supplied in the boiler ?

(A) 2160 kJ/kg

(B) 24 kJ/kg

(C) 2440 kJ/kg

(D) 2280 kJ/kg

50. In steam power cycle, reheat factor is usually in the range :

(A) 1.02 to 1.05

(B) 1.12 to 1.15

(C) 1.5 to 1.8

(D) 1.9 to 2.1

51. In a steam power plant, feed water heater is a heat exchanger to preheat feed water by :

(A) live steam from steam generator

(B) hot air from air preheater

(C) hot flue gases coming out of the boiler

(D) extracting steam from turbine

52. A condenser of a refrigeration system rejects heat at a rate of 120 kW, while its compressor consumes a power of 30 kW. The coefficient of performance of the system would be :

(A) 1/4 (B) 1/3

(C) 3 (D) 4

53. In a Rankine cycle, with maximum steam temperature being fixed from metallurgical considerations, as the boiler pressure increases :

(A) the condenser load will increase

(B) the quality of turbine exhaust will decrease

(C) the quality of turbine exhaust will increase

(D) the quality of turbine exhaust will remain unchanged

54. The output of a diesel engine can be increased without increasing the engine revolution or size in the following way :

(A) feeding more fuel

(B) heating incoming air

(C) scavenging

(D) supercharging

55. A 5 BHP engine running at full load would consume diesel of the order of :

(A) 0.3 kg/hr

(B) 1 kg/hr

(C) 3 kg/hr

(D) 5 kg/hr

56. If petrol is used in a diesel engine, then :

(A) higher knocking will occur

(B) efficiency will be low

(C) low power will be produced

(D) lot of fuel will remain unburnt

57. Heat transfer in liquid and gases takes place by :

(A) conduction

(B) convection

(C) radiation

(D) conduction and convection

58. Thermal diffusivity is :

(A) a dimensionless parameter

(B) function of temperature

(C) a physical property of the material

(D) useful in case of heat transfer by radiation

59. A grey body is one whose absorptivity :

(A) varies with temperature

(B) varies with wavelength of the incident ray

(C) is equal to its emissivity

(D) does not vary with temperature and wavelength of the incident ray

60. Two plane slabs of equal areas and conductivities in the ratio 1 : 2 are held together and temperature in between surface ends are t_1 and t_2. If junction temperature in between two surfaces is desired to be $\frac{t_1 + t_2}{2}$, then their thickness should be in the ratio of :

(A) 1 : 2

(B) 2 : 1

(C) 3 : 1

(D) 1 : 3

61. Inclination angle of a turning tool is measured on its :

(A) reference plane

(B) cutting plane

(C) orthogonal plane

(D) normal plane

62. The standard tolerance unit for sizes upto 500 mm is :

(A) $i = 0.45 \sqrt[3]{(D)} + 0.001\ D$

(B) $i = 0.45 \sqrt[3]{(D)} + 0.01\ D$

(C) $i = 0.45 \sqrt[3]{(D)} + 0.1\ D$

(D) $i = 0.45 \sqrt[3]{(D)}$

where D = Geometric mean of the two diameter limits

63. Which of the following welding process does not require any consumable ?

(A) Gas welding
(B) Electroslag welding
(C) Friction stir welding
(D) Thermit welding

64. The rolling of metal foils is usually carried out on a :

(A) two high rolling mill
(B) three high rolling mill
(C) four high rolling mill
(D) cluster rolling mill

65. The longest cylindrical job can be produced by :

(A) sand casting
(B) continuous casting
(C) investment casting
(D) powder metallurgy

66. In EDM which factor is essential ?

(A) Workpiece should be conductor of heat
(B) Workpiece should be magnetic
(C) Workpiece should be conductor of electricity
(D) Workpiece should be non-magnetic

67. The following gas can be used for gas welding :

(A) Hydrogen (B) LPG

(C) Acetylene (D) All of these

68. Permanent mould is used in the following casting processes :

(A) ceramic mould casting (B) investment casting

(C) CO_2 casting (D) none of these

69. Which abrasive is generally used for superabrasive grinding ?

(A) SiC (B) Al_2O_3

(C) CBN (D) None of these

70. Which tool reference system is generally easy to use for re-sharpening the cutting tool using grinding ?

(A) ORS (B) NRS

(C) ASA (D) WRS

71. In ASA system, if the tool nomenclature is 8-6-5-5-10-15-2 mm, then the side rake angle will be :

(A) 5° (B) 6°

(C) 8° (D) 10°

72. It is required to cut threads of 2 mm pitch on lathe. The lead screw has a pitch of 6 mm. If the spindle speed is 60 r.p.m., then the speed of lead screw will be :

(A) 10 r.p.m. (B) 20 r.p.m.

(C) 120 r.p.m. (D) 180 r.p.m.

73. A moving mandrel is used in :

(A) wire drawing (B) tube drawing

(C) metal cutting (D) forging

74. In order to get uniform thickness of the plate by rolling process, one provides :

(A) camber on the rolls (B) offset on the rolls

(C) hardening of the rolls (D) none of these

75. Consider the following characteristics :

(1) The cutting edge is normal to the cutting velocity

(2) The cutting forces occur in two directions only

(3) The cutting edge is wider than the depth of cut.

The characteristics applicable to orthogonal cutting would include :

(A) (1) and (2) (B) (1) and (3)

(C) (2) and (3) (D) (1), (2) and (3)

76. Chills are used in casting moulds to :

(A) achieve directional solidification

(B) reduce possibility of blow holes

(C) reduced the freezing time

(D) increase the smoothness of cast surface

77. Single point thread cutting tool should ideally have :

(A) zero rake (B) positive rake

(C) negative rake (D) normal rake

78. A straight teeth slab milling cutter of 100 mm diameter and 10 teeth rotating at 200 r.p.m. is used to remove a layer of 3 mm thickness from a steel bar. If the table feed is 400 mm/minute, the feed per tooth in this operation will be :

(A) 0.2 mm (B) 0.4 mm

(C) 0.5 mm (D) 0.6 mm

79. The correct sequence of the given processes in manufacturing by powde metallurgy is :

(A) bending, compacting, sintering and sizing

(B) bending, compacting, sizing and sintering

(C) compacting, sizing, bending and sintering

(D) compacting, bending, sizing and sintering

80. Consider the following statements :

For precision machining of non-ferrous allows, diamond is preferred becaus it has :

(1) low coefficient of thermal expansion

(2) high wear resistance

(3) high compression strength

(4) low fracture toughness

Which of these statements are correct ?

(A) (1) and (2)

(B) (1) and (4)

(C) (2) and (3)

(D) (3) and (4)

81. Which princely states were designated by the British as Shimla Hil states ?

(A) Those which were not contiguous to Punjab

(B) Those which were on the left bank of the Satluj

(C) Those whose rulers came from regions other than Punjab

(D) Those which were in the snow belt

82. In which district of Himachal Pradesh is Mahakali lake ?

(A) Kangra (B) Shimla

(C) Chamba (D) Mandi

83. On which river is Pong Dam ?

(A) Ravi (B) Beas

(C) Satluj (D) Swan

84. To which village of Solan District does Ajay Thakur, who was a member of Gold Medal winning men's Kabbaddi team at the 2014 Asian games, belong ?

(A) Dabhota (B) Kandaghat

(C) Deoli (D) Kunihar

85. At which place in Bilaspur District of H.P. is Rosin and Turpentine factory ?

(A) Kothipur (B) Raghnathpur

(C) Rajpura (D) Lakhanpur

86. With which district of H.P. is 'सुलिया टंगोई गई जान' ('Sulia Tangoee Gai Jaan') folk song associated ?

(A) Kangra (B) Una

(C) Sirmaur (D) Solan

87. Which of the following blocks of Chamba District has been identified for setting up model schools ?

(A) Mehla (B) Bhattiyat

(C) Bharmaur (D) Chamba

88. Where is Bal/Balika Ashram in Shimla District ?

(A) Kufri (B) Durgapur

(C) Khaneti (D) Mandal

89. In which district of H.P. is Shah Nehar project ?

(A) Bilaspur (B) Hamirpur

(C) Kangra (D) Solan

90. According to the 2010-11 economic survey which two cities of H.P. are being developed as solar cities ?

(A) Shimla and Mandi
(B) Shimla and Dharmsala
(C) Shimla and Hamirpur
(D) Shimla and Una

91. When did India win a Gold Medal in wrestling in the Asian Games before 2014 ?

(A) 1982
(B) 1986
(C) 1990
(D) 1994

92. In the world freedom of press index of 2013 based on a study conducted by an organisation called 'Reporters without Border's what position does India occupy among 179 countries ?

(A) 116
(B) 127
(C) 136
(D) 140

93. Which country has gone to the international court of justice challenging Britain's right over Diego Garcia Island ?

(A) India
(B) Maldives
(C) Marititus
(D) Myanmar

94 Which organisation does Lalitha Kumaramanglam head ?

(A) National Human Rights Commission

(B) National Commission for Women

(C) Society for Prevention of Cruelity to Animals

(D) Film Censor Board

95. Who among the following is one of the winners of 2014 Nobel Prize in Physics ?

(A) Eric Betzig

(B) William Moerner

(C) Stefan Hell

(D) Shuji Nakamura

96. When was HMT complex Pinjore inaugurated ?

(A) 1958

(B) 1960

(C) 1963

(D) 1965

97. Who is the present interlocutor in the Naga peace talks ?

(A) R.S. Pandey

(B) Swaraj Kaushal

(C) K. Padmanabhaiah

(D) R. N. Ravi

98. Who among the following has been on indefinite hunger strike to protest against human rights abuses in North-East India particularly in Manipur and demanding withdrawal of Armed Forces Special Powers Act ?

(A) Irom Chanu Sharmila
(B) Manjulatha Kalanidhi
(C) Bandana Deori
(D) Apurba Baruah

99. According to Prime Minister Modi what was his primary reason for visiting Kyoto during his visit to Japan ?

(A) Social
(B) Cultural
(C) Economic
(D) Political

100. Who is General Prayut Chan-o-Cha ?

(A) President of Korea
(B) Prime Minister of Vietnam
(C) Prime Minister of Thailand
(D) Chief of Chinese Army