TPSC JE Gr-VB

Previous Year Paper
(Mechanical)
08 Oct, 2023

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO.

TR/SET/MECHANICAL/PRE/DIPLOMA/2023

TEST BOOKLET

GENERAL STUDIES & ENGINEERING APTITUDE

Test Booklet Series

B

_____

(Signature of the Candidate)

_____

(Invigilator's Signature)

Time Allowed : Two (2) hours　　　　　　**Maximum Marks : 100**

INSTRUCTIONS

1. PLEASE CHECK THE 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. **ENCODE CLEARLY THE TEST BOOKLET SERIES A,B,C OR D AS THE CASE MAY BE IN THE APPROPRIATE PLACE IN THE ANSWER SHEET BY BLACK BALL POINT PEN ONLY.**

3. This Test Booklet contains 100 items (questions). Each question has four responses (answers). You will select the responses which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the most appropriate. In any case, choose ONLY ONE response for each item.

4. You have to mark all your responses ONLY on the separate Answer Sheet provided. See directions in the Answer Sheet.

5. All items carry equal marks.

6. Before you proceed to mark on the Answer Sheet the responses to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.

7. After you have completed filling in responses on the Answer Sheet and the Examination is completed, you should handover the Answer Sheet to the Invigilator only. You are permitted to take away the Test Booklet.

8. Sheets for rough work are appended on the Test Booklet at the end.

9. **Penalty for wrong answers :**

    (a) There will be four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-fourth** of the marks assigned to that question will be deducted as penalty.

    (b) If a candidate gives more than one answer, it will be treated as a **Wrong Answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.

    (c) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

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Four options are given against each of the following questions. Select the correct option from the four options and encode it in the Answer Sheet by using **Black Ball Point Pen** only as per example given below :

Example : P : Aunt Polly wanted to trap Tom ——— damaging confessions.

(A) into   (B) with   (C) by   (D) on

Example Q : Let's watch ——— movie ; I mean 'Pather Panchali'.

(A) a   (B) an   (C) the   (D) No article is needed

PART – A

Direction for Question Nos. 1 to 4.

Choose the appropriate prepositions/articles for the blank spaces from the given alternatives.

1. Fix the portrait _____ the TV.

(A) inside   (B) over

(C) under   (D) above

2. This will be very useful _____ me.

(A) to   (B) for

(C) with   (D) of

3. Kolkata stands on _____ Ganges.

   (A) the   (B) an

   (C) a   (D) No article is needed

4. My brother has settled in _____ United States.

   (A) a   (B) an

   (C) the   (D) No article is needed

Direction Question Nos. 5 and 6

Find out words having the same or nearly the same meaning to the underlined words in the sentences from the given options.

5. Narayana Hemachandra's dress was rather <u>queer</u>.

   (A) Clumsy   (B) Dirty

   (C) Strange   (D) Funny

6. Do not <u>tread</u> on the flower beds.

   (A) Jump   (B) Walk

   (C) Run   (D) Cross

Direction Question Nos. 7 and 8

Choose from the given options/words opposite in meaning to the underlined words in the sentences.

7. She has not <u>strength</u> enough to walk upstairs.

   (A) Weakness   (B) Courage

   (C) Diffidence   (D) Promptness

8. We must get to the <u>bottom</u> of this mystery.

(A) profile   (B) border

(C) height   (D) top

Direction for Question Nos. 9 and 10

The underlined and lettered parts of each sentences below may contain an error in grammar, usage, words choice (diction). or expression (idiom). Read each sentence carefully and identify which item if any, contains an error. If it contains no error, answer is D.

9. <u>At the conclusion</u> of the meeting, the new members <u>sweared</u> that they would
      A   B

<u>never reveal</u> the secret.   <u>No error</u>
    C   D

(A) At the conclusion   (B) Sweared

(C) Never reveal   (D) No error

10. <u>With the development</u> of antitoxins and serums, there are hardly <u>no</u> cases of smallpox
      A   B

or yellow fever <u>anywhere</u> in the world. <u>No error</u>
               C   D

(A) With the development   (B) no

(C) anywhere   (D) No error

11. Tripura acceded to the Indian Union on

(A) 15th August, 1947   (B) 9th September, 1949

(C) 15th October, 1949   (D) 21st January, 1972

12. Who was the Chief Justice of the Supreme Court of India just before the Chief Justice of the Supreme Court of India, Shri D. Y. Chandrachud ?

(A) Justice S. N. Kaul

(B) Justice K. M. Joseph

(C) Justice C. R. Mathur

(D) Justice U. U. Lalit

13. Where is the Kuno National Park situated ?

(A) Uttar Pradesh

(B) Madhya Pradesh

(C) Uttarakhand

(D) Rajasthan

14. Where was the venue of the 108th Indian Science Congress that was held in January, 2023 ?

(A) Nagpur

(B) Indore

(C) Pune

(D) Hyderabad

15. In the year 2022, Maharaja Bir Bikram College of Tripura celebrated the

(A) Silver Jubilee

(B) Golden Jubilee

(C) Platinum Jubilee

(D) Centenary

16. In which Cricket Tournament female umpire officiated for the first time in India ?

(A) Duleep Trophy

(B) Deodhar Trophy

(C) Vijay Hazare Trophy

(D) Ranji Trophy

17. What is the fixed interest rate declared in 2023 for the 'Mahila Samman Bhachat Patra' ?

    (A) 7%   (B) 7.5%

    (C) 8%   (D) 8.5%

18. India's first ever Night Sky Sanctuary set up in which State to boost Astro Tourism ?

    (A) Ladakh   (B) Jammu and Kashmir

    (C) Uttarakhand   (D) Himachal Pradesh

19. P M Narendra Modi has recently launched the World's longest river cruise 'Ganga Vilas' from Varanasi to

    (A) Guwahati (Assam)   (B) Dibrugarh (Assam)

    (C) Dhaka (Bangladesh)   (D) Kolkata (West Bengal)

20. Which country has formally adopted the Euro as its currency, making it the 20th member State of European Union ?

    (A) Greece   (B) Croatia

    (C) Romania   (D) Slovenia.

21. Calculate the torque which a shaft of 3 cm diameter can safely transmit, if the shear stress is 48 N/cm²

   (A) 27π Ncm   (B) 8π Ncm

   (C) 54π Ncm   (D) 48π Ncm

22. The load required to produce a unit deflection in a spring is called _____.
   (Fill up the blank with only one correct option)

   (A) flexural rigidity   (B) torsional rigidity

   (C) spring stiffness   (D) Young's modulus

23. In order to avoid tearing off the plate at an edge, the distance from the centre of the rivet hole of the nearest edge of the plate (i.e. margin) should be ____.
   Assume, d = diameter of rivet hole in mm.
   (Choose the correct answer from options given below)

   (A) 1.0d   (B) 1.5d

   (C) 2.0d   (D) 2.5d

24. Select the correct name of the rivet head for boiler applications (shown in the figure given below) from the option given

   (A) Snap   (B) Pan

   (C) Conical   (D) Steeple

25. The turbine recommended for a head of 12m is

   (A) Pelton turbine   (B) Francis turbine

   (C) Kaplan turbine   (D) None of these

26. The velocity of fluid particle at the centre of pipe section is

   (A) zero

   (B) minimum

   (C) maximum

   (D) average of full section

27. The porter governor can be classified as

   (A) Inertia type governor

   (B) Pendulum type governor

   (C) Dead weight type centrifugal governor

   (D) None of the above

28. The size of the gear is usually specified by

   (A) pressure angle

   (B) circular pitch

   (C) tooth thickness

   (D) pitch circle diameter

29. A closed system is one in which

   (A) mass does not cross boundaries of the system, though energy may do so

   (B) mass crosses the boundary but not the energy

   (C) neither mass nor energy crosses the boundaries of the system

   (D) both energy and mass cross the boundaries of the system

30. Two beams of equal cross-sectional area are subject to equal bending moment. If one beam has square cross-section and the other has circular cross-section, then

   (A) both beams will be equally strong

   (B) circular section beam will be stronger

   (C) square cross-section beam will be stronger

   (D) the strength of the beam will depend upon the nature of loading

31. Which of the materials possesses highest value of Poisson's ratio ?

(A) copper

(B) malleable iron

(C) rubber

(D) gold

32. A steel bar of dimension 10 mm × 1 mm × 1 mm is free to expand is heated from 15°C to 25°C. What stress shall be developed ?

(A) Tensile stress

(B) No stress

(C) Shear stress

(D) Compressive stress

33. Broadly speaking, water is

(A) 10 times as compressible as steel

(B) 20 times as compressible as steel

(C) 80 times as compressible as steel

(D) 800 times less compressible than steel

34. In order to have maximum power from a Pelton turbine, the bucket speed must be

(A) equal to the jet speed

(B) equal to half of the jet speed

(C) equal to twice of the jet speed

(D) independent of the jet speed

35. The air-fuel ratio in petrol engines is controlled by

(A) controlling valve opening/closing

(B) governing

(C) injection

(D) carburetion

36. The temperature in oxy-acetylene welding reaches to the order of

(A) 500°C

(B) 1500°C

(C) 2500°C

(D) 3500°C

37. An electrician's solder is generally an alloy of

    (A) iron and mercury   (B) zinc and mercury

    (C) tin and copper   (D) tin and lead

38. Anodising is

    (A) a zinc diffusion process

    (B) an oxidizing process used for aluminum and magnesium articles

    (C) a process used for making thin phosphate coatings on steel to act as a base or primer for enamels and paints

    (D) is the process of coating of zinc by hot dipping

39. The number of elements in Tool signature in machining tools are

    (A) two   (B) three

    (C) seven   (D) eight

40. Single point thread cutting tool should ideally have

    (A) zero rake angle   (B) positive rake angle

    (C) negative rake angle   (D) single point angle

41. The crystal structure of Brass is

    (A) Face Centered Cubic (FCC)   (B) Body Centered Cubic (BCC)

    (C) Hexagonal Close Packed (HCP)   (D) None of these

42. A rod of length L and diameter D is subjected to a tensile load P. Which of the following is sufficient to calculate the resulting change in diameter ?

    (A) Young's modulus   (B) Shear modulus

    (C) Poisson's ratio   (D) Both Young's modulus and shear

43. Steel is an alloy of

   (A) Iron and Carbon   (B) Copper and Tin

   (C) Iron and Graphite   (D) Aluminum and Silicon

44. De Laval turbine is used for applications requiring

   (A) high power, high speed   (B) high power, low speed

   (C) low power, high speed   (D) low power, low speed

45. The load required to produce a unit deflection in a spring is called

   (A) stiffness of a spring   (B) power of a spring

   (C) specific weight of a spring (D) ultimate load

46. For a four-bar linkage in toggle position (when input force is zero), the value of mechanical advantage is

   (A) 0.0   (B) 0.5

   (C) 1.0   (D) ∞

47. The ratio of the effective length of a column to the least radius of gyration of its cross-section is called the

   (A) slenderness ratio   (B) transition ratio

   (C) dynamic ratio   (D) column ratio

48. Fourier's law of heat conduction is valid for

   (A) One dimensional cases only

   (B) Two dimensional cases only

   (C) Three dimensional cases only

   (D) Regular surfaces having non-uniform temperature gradients

49. For obtaining high value of Coefficient of Performance, the pressure range of compressor should be

    (A) there is no such criterion related to pressure range

    (B) high

    (C) low

    (D) None of these

50. Psychrometric chart

    (A) is seldom used for air conditioning design work

    (B) enables to determine wet bulb, and dew point temperatures

    (C) is a graphical chart for conversion of british units into metric system of units

    (D) provides graphical plots for physical and thermal properties of moist air

51. The Muff Couplings are generally designed as

    (A) thin vessel   (B) thick vessel

    (C) solid shaft   (D) hollow shaft

52. Factor of safety is the ratio of

    (A) ultimate stress to working stress   (B) working stress to maximum stress

    (C) breaking stress to ultimate stress   (D) ultimate stress to breaking stress

53. The following is formed by revolving rectangle about one of its sides which remains fixed

    (A) Cylinder   (B) Sphere

    (C) Hemisphere   (D) Cone

54. Thread rolling is a

(A) Hot forging process

(B) Cold forging process

(C) Cold extrusion process

(D) Hot extrusion process

55. The hydraulic mean depth or the hydraulic radius is the ratio of

(A) area of flow and wetted perimeter

(B) wetted perimeter and diameter of pipe

(C) velocity of flow and area of flow

(D) None of the above

56. The coefficient of viscosity may be determined by

(A) capillary tube method

(B) orifice type viscometer

(C) rotating cylinder method

(D) All of these

57. The loss of head at exit of a pipe is (where v = velocity of liquid in the pipe)

(A) $\dfrac{v^2}{2g}$

(B) $\dfrac{0.5\, v^2}{2g}$

(C) $\dfrac{0.375\, v^2}{2g}$

(D) $\dfrac{0.75\, v^2}{2g}$

58. In a riveted joint, when the number of rivets decreases from the inner most row to outer most row, the joint is said to be

(A) chain riveted

(B) zig-zag riveted

(C) diamond riveted

(D) None of these

59. What is the relation between maximum stress induced due to sudden loading to maximum stress the gradual loading ?

(A) Maximum stress in sudden load is equal to the maximum stress in gradual load

(B) Maximum stress in sudden load is half to the maximum stress in gradual load

(C) Maximum stress in sudden load is twice to the maximum stress in gradual load

(D) Maximum stress in sudden load is four times to the maximum stress in gradual load

60. What is the strain energy stored in a body when the load is applied suddenly ?

(A) $\sigma E/V$

(B) $\sigma E^2/V$

(C) $\sigma V^2/E$

(D) $\sigma V^2/2E$

61. The fastest cooling rate is achieved when steel is quenched in

(A) air

(B) oil

(C) water

(D) brine

62. Plasticizers are added in plastics to

(A) reduce hardness

(B) improve flexibility

(C) improve their strength

(D) reduce glass transition temperature (tg)

63. If a heat engine attains 100% thermal efficiency, it violates

(A) Zeroth law of thermodynamics

(B) First law of thermodynamics

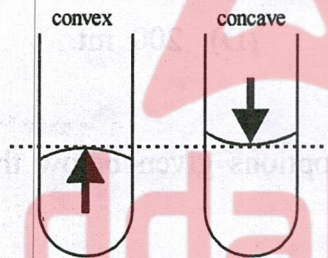(C) Second law of thermodynamics

(D) Law of conservation of energy

64. Stefan Boltzmann law is applicable for heat transfer by

(A) Conduction

(B) Convection

(C) Radiation

(D) Conduction and radiation combined

65. Fouling factor is used

(A) in heat exchanger design as a safety factor

(B) in case of Newtonian fluids

(C) when a liquid exchanges heat with a gas

(D) None of these

66. Air refrigeration cycle is used in

(A) Domestic refrigerator

(B) Commercial refrigerator

(C) Air conditioning

(D) Gas liquefaction

67. For ammonia system the pipe should be of following material

(A) Brass

(B) Copper

(C) Cast steel

(D) Aluminium

68. 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) None of these

69. Thermal efficiency of two stroke cycle engine is _____ stroke cycle engine

(A) equal to

(B) less than

(C) greater than

(D) None of these

70. As the battery is discharged, the active materials in both negative and positive plates are changed to

(A) Spongy lead

(B) Sulphuric acid

(C) Lead oxide

(D) Lead sulphate

71. The purpose of the fluid coupling is to act as a

(A) Automatic gear changer

(B) Flexible power transmitting coupling

(C) Synchronizing device

(D) None of these

72. In gear systems speed reduction means torque

(A) Stabilization

(B) Increase

(C) Reduction

(D) None of these

73. In a green-sand moulding process, uniform ramming leads to

(A) Less chance of gas porosity

(B) Uniform flow of molten metal into the mould cavity

(C) Greater dimensional stability of the casting

(D) Less sand expansion type of casting defect

74. In PERT analysis a critical activity has

(A) Maximum float

(B) Zero float

(C) Maximum cost

(D) Minimum cost

75. Gantt chart is used for

(A) Forecasting sales

(B) Production schedule

(C) Scheduling and routing

(D) Linear programming

76. The Bell Coleman Cycle is a refrigeration cycle where the working fluid is air. It is the modification of reverse Carnot cycle, having only difference. Now, you have to identify that difference from four options given below :

    (A) two isentropic processes replaced by two isobaric processes

    (B) two isentropic processes replaced by isothermal processes

    (C) two isobaric processes replaced by two isothermal processes

    (D) two isothermal processes replaced by two isobaric processes

77. With reference to the adjoining figure, 'E' is the Heat Engine having efficiency of 0.4. 'R' is the Refrigerator. If $Q_2 + Q_4 = 3Q$, then choose only one correct value of the COP for the refrigerator.

    (A) 1.33   (B) 2.5

    (C) 4.0   (D) 5.0

78. In a Electrolux refrigerator, one part of the refrigerator contains hydrogen gas at 12 bar pressure. Now, choose the name of that part from the options given below :

    (A) Evaporator   (B) Rectifier

    (C) Generator   (D) Absorber

79. In Fluid Mechanics, Kinematic viscosity (v) is the ratio of viscosity (μ) and density (ρ). Now, choose the correct option from four options given below, to determine its (v) unit.

    (A) $(\text{Length})^2$. Time   (B) $(\text{Time})^2$. Length

    (C) $\dfrac{(\text{Length})^2}{\text{Time}}$ (D) $\dfrac{(\text{Time})^2}{\text{Length}}$

80. A jet strikes a stationary plate normally with a velocity of 8 m/s and plate experiences a force of 120 N. Choose the power obtained in kW from options given below :

    (A) 960   (B) Zero

    (C) 7.68   (D) 0.96

81. Why a manometer is used in fluid system ?

    (A) Measuring atmospheric pressure

    (B) Measuring pressure in pipes

    (C) Measuring pressure in venturimeter

    (D) Measuring gauge pressure

82. Select the correct name of the chemical compound which is used to absorb carbon monoxide.

    (A) Cuprous Chloride solution   (B) Hydrogen Bromide solution

    (C) Hydrogen Sulphate solution   (D) None of these

83. Due to capillary property of liquid, fluid in the small diameter glass pipes generally formed two types of meniscus .... Convex and Concave, as shown in the figure given below. Now, choose one name of the liquid from the options given below that does not form concave meniscus in a glass tube.

    (A) Water   (B) Carbon tetrachloride

    (C) Alcohol   (D) Hydrochloric acid

84. A uniform body 3m long, 2m wide and 1m deep floats in water. If the depth of immersion is 0.6m, then choose the weight of the body from the options given below :

    (A) 3.53 kN   (B) 3.33 kN

    (C) 35.3 kN   (D) 33.3 kN

85. Select the correct name of the precious metals used in all successful catalytic converters.

   (A) Platinum/Molybdenum   (B) Platinum/Vanadium

   (C) Platinum/Rhodium   (D) Platinum/Cobalt

86. Name the equipment considered as 'reference' to measure the quality at atmospheric SO_2.

   (A) Flame photometric analyzer   (B) West-Gaeke colourimetric analyzer

   (C) Chemiluminescent analyzer   (D) Non-dispersive infrared analyzer

87. What is the distance from courts/ institutions/hospitals declared as 'Silent Zone' by the Environment Protection Act, 1986 ?

   (A) 50 mt.   (B) 100 mt.

   (C) 150 mt.   (D) 200 mt.

88. Select the correct process from the options given below that constitutes ideal otto cycle ?

   (A) Constant volume heat addition (B) Constant pressure heat addition

   (C) Isentropic expansion   (D) Isentropic compression

89. In automotive batttery, which one of the following is the constituent of battery electrolyte ?

   (A) Pure sulphuric acid   (B) Nitric acid

   (C) Phosphoric acid   (D) Pure hydrochloric acid

90. How much depth a solar pond should have ?

   (A) Around 1 mt. to 2 mt. deep   (B) Around 2 mt. to 3 mt. deep

   (C) Around 2.5 mt. to 3.5 mt. deep   (D) None of these

91. Wind energy directly relates with wind speed. There is a wind speed based classification method for describing types of wind. According to this scale, there are 12 different types of winds. For example : wind having speed range of 21-31 km/hr is known as 'Moderate wind'. Now, name this scale mentioned in the question.

   (A) Space weather scale   (B) Beaufort scale

   (C) Roentgen scale   (D) Koppen scale

92. Form the options given below, choose the correct percentage of pure ethanol which is known as 'Anhydrous ethanol' ?

   (A) 67%   (B) 89.75%

   (C) 95.5%   (D) 99.7%

93. The basic difference between Horizontal axis wind turbinbe and Vertical axis wind turbine is the absence of one component. Identify that component from the options given below :

   (A) Hub   (B) Gear box

   (C) Yaw control   (D) Pitch control

94. What is the maximum length of the work piece that can be fit on a lathe machine ?

   (A) Height of centres   (B) Maximum diameter of work

   (C) Length between centres   (D) Maximum length of machine bed

95. Which one of the following operation is also knwon as 'Internal Turning' ?

   (A) Milling   (B) Facing

   (C) Reaming   (D) Boring

96. What is the other name of 'Up Milling'?

   (A) End milling

   (B) Face milling

   (C) Climb milling

   (D) Conventional milling

97. For manufacturing the cutting tool, which material has to be used to enhance the high elastic limit and corrosion resistance of the base metal?

   (A) Tungsten

   (B) Silicon

   (C) Vanadium

   (D) Cobalt

98. Match the machine tools (Group-a) with the probable operations (Group-b)

Group–a		Group–b	
P	Centre lathe	I	Slotting
Q	Milling	II	Counter-boring
R	Grinding	III	Knurling
S	Drilling	IV	Dressing

   (A)   P-I, Q-II, R-IV, S-III

   (B)   P-II, Q-I, R-IV, S-III

   (C)   P-III, Q-I, R-IV, S-II

   (D)   None of these

99. What is the limiting condition for materials obeying Hook's Law?

   (A) Elastic limit

   (B) Proportionality limit

   (C) Plastic limit

   (D) None of these

100. Which statement is true about the value of Poisson's ratio?

   (A) Greater than 1

   (B) Less than 1

   (C) Equal to 1

   (D) None of these.