Indian Air Force

Group 'X' (Technical) Trade

Solved Model Paper

Model Paper-I

English

Directions—(Q. 1–3) Read the following passage carefully and answer the questions given below it in the context of the passage.

Long long ago there lived in Baghdad a very rich man named Sindbad. He was a famous sailor, who sailed all over the world. In the beginning he was a man of ordinary means. But it was only by undertaking as many as seven voyages that he was able to acquire fabulous wealth. In voyages, he had to face terrible hardships and dangers. Actually his father was a rich man and had left him a lot of money. But soon after his death, he wasted all his wealth very foolishly. Later he joined a group of merchants and sailed with them in a ship.

1. What do you mean by the word 'Voyages' as mentioned in the passage ?
   (A) The great revenge
   (B) The great robbery
   (C) Sea journey
   (D) None of these
2. Sindbad's father has been mentioned in the passage as—
   (A) A very foolish man
   (B) A rich man
   (C) A great sailor
   (D) A courageous man
3. Whom did Sindbad join after losing his money ?
   (A) A group of merchants
   (B) His father's business
   (C) The royal army
   (D) None of these
4. Plural of 'Tooth' is .....
5. Opposite Gender of 'Mister' is .....
6. Superlative Degree of 'Late' is .....
7. A man who helps strangers is called.....
8. An unmarried woman is called .....
9. Synonym of 'Affluent' is—
   (A) Poor (B) Opulent
   (C) Needy (D) Scanty
10. Synonym of 'Accede' is—
    (A) Dissent (B) Disagree
    (C) Misrepresent (D) Consent
11. Choose the mis-spelt word—
    (A) Monarch (B) Tomotto
    (C) Monitor (D) Muscle
12. Remove 'too' from the given sentence—
    The news is too good to be true.
    (A) The news is so good that it cannot be true
    (B) The news is so good to be true
    (C) The news is so good if it is true
    (D) None of these
13. Change the Narration—
    Mohini said to me, "Trust in God."
    (A) Mohini advised me that I should trust in God
    (B) Mohini advised me should trust in God
    (C) Mohini advised me trusted in God
    (D) Mohini advised me to trust in God
14. Change into interrogative form—
    Money does not grow on trees.
    (A) Does money grow on trees ?
    (B) Is money grows on trees ?
    (C) Was money grows on trees ?
    (D) Did money grows on trees ?
15. Adjective of 'Circle' is ...

Directions—(Q. 16–20) Fill in the blanks with the words given below.

16. Although he is a rich man.....he is not cruel for the poor.
    (A) But (B) Yet
    (C) Hence (D) And

17. What...beautiful flower this is !
(A) A (B) An
(C) The (D) No-article

18. He stood.....the door.
(A) On (B) In
(C) At (D) Over

19. The great patriot and writer..... come. (has/have)

20. His means.....ample. (is/are)

Physics

21. Maximum density of water as at the temperature—
(A) 32° F (B) 39·2° F
(C) 42° F (D) 4° F

22. Absolute zero (0K) is the temperature at which—
(A) Molecular motion of the molecules stops
(B) Ice melts and water freezes
(C) Volume and pressure of a gas become zero
(D) None of these

23. Which of the following is vector quantity ?
(A) Current
(B) Charge
(C) Potential difference
(D) Current density

24. An iron needle floats on the surface of water. This phenomenon is attributed to—
(A) Upthrust of liquid
(B) Viscosity
(C) Surface tension
(D) Gravitational forces

25. Threshold frequency for photoelectric effect on sodium corresponds to a wavelength 5000 Å. Its work function is—
(A) 15 J (B) 16×10^{-14} J
(C) 4×10^{-19} J (D) 4×10^{-18} J

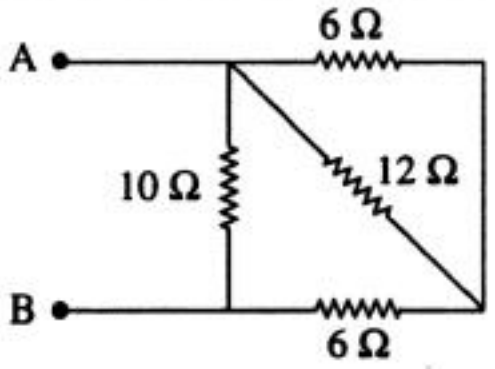
26. From a height h a person throws one particle vertically downwards with velocity u and another particle with same velocity u in the horizontal direction. On reaching earth's surface the ratio of their velocities will be—
(A) 1 : 2 (B) 1 : 1
(C) $\sqrt{2gh + u^2} : u$ (D) $\frac{\sqrt{2gh}}{g} : u$

27. Dimensions of Planck's constant are those of—
(A) Force × Time
(B) Energy × Distance
(C) Energy/Time
(D) Energy × Time

28. Which of the following has dimensions different from rest ?
(A) $\frac{L}{R}$ (B) CR
(C) $\sqrt{LC}$ (D) $\frac{1}{CR}$

29. The equation of a progressive wave is—
$$y = 0{\cdot}04 \sin (157\,t - 3{\cdot}14x)$$
where x and y are in metre and t in second. The wavelength of the wave will be—
(A) 3m (B) 2m
(C) $\frac{3}{4}$ m (D) 4m

30. The effective resistance across AB—



(A) 6 Ω (B) 8 Ω
(C) 4 Ω (D) None of these

31. Sea animals are safe in winter in the cold countries because of—
(A) Their body conditions
(B) High specific heat of water
(C) Low conductivity of water
(D) Anomalous expansion of water

32. The pressure coefficient of a gas is—
(A) 0·00367 per °C (B) – 273 per °C
(C) 0·981 per °C (D) 0·314 per °C

33. In adiabatic process, the quantity which remains constant is—
(A) Temperature
(B) Pressure
(C) Total heat contents of the system
(D) Volume

34. Two sources are said to be coherent if—
(A) These are giving monochromatic source
(B) These are giving monochromatic waves of same amplitude
(C) These are derived from same source of monochromatic waves
(D) These fulfil any of the above conditions

35. With the increase in temperature the frequency of sound from an organ pipe—
(A) Decreases
(B) Increases
(C) Remains unchanged
(D) Changes erratically

36. In a cyclic process, the internal energy of an ideal gas—
(A) Increases
(B) Decreases
(C) Remains constant
(D) Becomes zero

37. Unit of surface tension is—
(A) $N\,m^{-1}$ (B) $N\,m^{-1}$
(C) N^2m^{-1} (D) $N\,m^{-3}$

38. The principle of controlled chain reaction is used in—
(A) Atomic energy reactor
(B) Atom bomb
(C) In the core of sun
(D) Artificial radioactivity

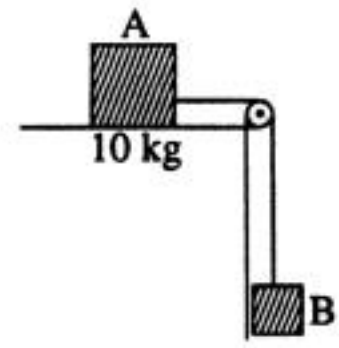
39. When a body moves with constant speed in a circular path, then—
(A) It has constant velocity
(B) It has constant acceleration
(C) No work is done
(D) None is correct

40. What type of semiconductor is formed when silicon is dopped with phosphorus ?
(A) P-type semiconductor
(B) N-type semiconductor
(C) P-N junction
(D) None of these

41. The theory associated with secondary wavelets is—
(A) Dopplers effect
(B) Bohr's theory
(C) Huygen's theory
(D) Uncertainty principle

42. In an inductor of inductance L = 100 mH, a current of 10 A is flowing. The energy stored in the inductor is—
(A) 5 J (B) 10 J
(C) 100 J (D) 1000 J

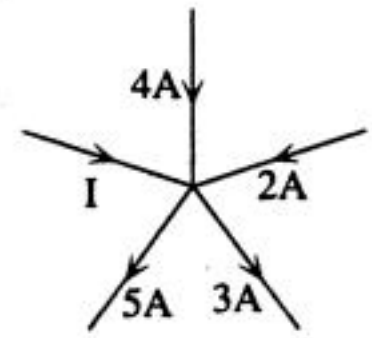
43. If mass of A = 10 kg, coefficient of static friction = 0·22, coefficient of dynamic friction = 0·2, then the mass of B to start motion is—



(A) 2 kg (B) 2·2 kg
(C) 4·8 kg (D) 200 gm

44. In which thermodynamic process volume remains same ?
(A) Isobaric (B) Isothermal
(C) Adiabatic (D) Isochoric

45. In the given current distribution what is the value of I ?



(A) 3 A (B) 8 A
(C) 2 A (D) 5 A

Mathematics

46. Of the three numbers, the ratio of the first and second is 8 : 9 and that of the second and third is 3 : 4. If the product of the first and third numbers is 2400, then the second number is—
(A) 45 (B) 40
(C) 30 (D) 55

47. Two trains start from station A and B and travel towards each other at the speeds of 50 kms/hour and 60 kms/hour respectively. At the time of their meeting, the second train has travelled 120 kms more than the first. The distance between A and B is—
(A) 990 kms (B) 1200 kms
(C) 1320 kms (D) 1440 kms

48. If $\frac{3a+5b}{3a-5b}=5$, then $a:b$ is equal to—

(A) 2 : 1 (B) 5 : 3
(C) 3 : 2 (D) 5 : 2

49. The sum of all two-digits numbers is—

(A) 4995 (B) 4950
(C) 4945 (D) 4905

50. Two cards are drawn at random from a pack of 52 cards. The probability that both are the cards of spade is—

(A) $\frac{1}{26}$ (B) $\frac{1}{4}$
(C) $\frac{1}{17}$ (D) None of these

51. A bag contains 4 white, 5 red and 6 green balls. Three balls are picked up randomly. The probability that a white, a red and a green ball is drawn, is—

(A) $\frac{15}{91}$ (B) $\frac{30}{91}$
(C) $\frac{20}{91}$ (D) $\frac{24}{91}$

52. A coin is tossed twice. The probability of getting head both the times is—

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$
(C) $\frac{3}{4}$ (D) $\frac{1}{8}$

53. A straight line L is perpendicular to the straight line $5x - y = 1$ and the area of the triangle formed by the line L and the coordinate axes is 5. The equation of the straight line L is—

(A) $x + 5y = 5$
(B) $x + 5y = \pm 5\sqrt{2}$
(C) $x - y = 5$
(D) $x - 5y = 5\sqrt{2}$

54. The angle between the straight lines whose intercepts on the axes are $a, -b$ and $b, -a$ respectively is—

(A) $\tan^{-1}\frac{a^2-b^2}{ab}$ (B) $\tan^{-1}\frac{b^2-a^2}{2}$
(C) $\tan^{-1}\frac{b^2-a^2}{2ab}$ (D) None of these

55. If the length of tangent drawn from the point (5, 3) to the circle $x^2 + y^2 + 2x + ky + 17 = 0$ be 7, then $k =$

(A) 4 (B) -4
(C) -6 (D) $\frac{13}{2}$

56. If a circle passes through the points (0, 0), $(a, 0)$ and $(0, b)$, then its centre is—

(A) (a, b) (B) (b, a)
(C) $\left(\frac{a}{2}, \frac{b}{2}\right)$ (D) $\left(\frac{b}{2}, -\frac{a}{2}\right)$

57. The angle between the two tangents from the origin to the circle $(x-7)^2 + (y+1)^2 = 25$ is—

(A) 0 (B) $\frac{\pi}{3}$
(C) $\frac{\pi}{6}$ (D) $\frac{\pi}{2}$

58. If θ be the angle between the vectors $\vec{a}$ and $\vec{b}$ and $|\vec{a} \times \vec{b}| = \vec{a} \cdot \vec{b}$, then $\theta =$

(A) π (B) $\frac{\pi}{2}$
(C) $\frac{\pi}{4}$ (D) 0

59. The position vectors of the points A, B and C are $\hat{i} + \hat{j}$, $\hat{j} + \hat{k}$ and $\hat{k} + \hat{i}$ respectively. The vector area of the $\Delta ABC = \frac{1}{2}\vec{\alpha}$, where $\vec{\alpha} =$

(A) $-\hat{i} + \hat{j} + \hat{k}$
(B) $\hat{i} - \hat{j} + \hat{k}$
(C) $\hat{i} + \hat{j} - \hat{k}$
(D) $\hat{i} + \hat{j} + \hat{k}$

60. $\lim_{x \to 0} \frac{x^3 \cot x}{(1 - \cos x)} =$

(A) 0 (B) 1
(C) 2 (D) -2

61. If $y = \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)^2$, then $\frac{dy}{dx} =$

(A) $1 - \frac{1}{x^2}$ (B) $1 + \frac{1}{x^2}$
(C) $1 - \frac{1}{2x}$ (D) None of these

62. If $y = 1 + x + \frac{x^2}{\lfloor 2} + \frac{x^3}{\lfloor 3} + \ldots\ldots + \frac{x^n}{\lfloor n}$, then $\frac{dy}{dx} =$

(A) y (B) $y + \frac{x^n}{\lfloor n}$

(C) $y - \frac{x^n}{\lfloor n}$ (D) $y - 1 - \frac{x^n}{\lfloor n}$

63. If $x = \frac{1 - t^2}{1 + t^2}$ and $y = \frac{2at}{1 + t^2}$, then $\frac{dy}{dx} =$

(A) $\frac{a(1 - t^2)}{2t}$ (B) $\frac{a(t^2 - 1)}{2t}$

(C) $\frac{a(t^2 + 1)}{2t}$ (D) $\frac{a(t^2 - 1)}{t}$

64. $\int \frac{dx}{e^x + e^{-x}} =$

(A) $\tan^{-1}(e^{-x}) + c$ (B) $\tan^{-1}(e^x) + c$

(C) $\log(e^x - e^{-x})$ (D) $\log(e^x + e^{-x})$

65. $\int \frac{dx}{x + x \log x} =$

(A) $\log(1 + \log x)$

(B) $\log \cdot \log(1 + \log x)$

(C) $\log x + \log(\log x)$

(D) None of these

66. A number, when divided by 119, leaves a remainder of 19. If it is divided by 17, it will leave a remainder of—

(A) 19 (B) 10

(C) 7 (D) 2

67. If $x = 7 - 4\sqrt{3}$, then $\sqrt{x} + \frac{1}{\sqrt{x}}$ is equal to—

(A) 1 (B) 2

(C) 3 (D) 4

68. $0{\cdot}4\overline{23}$ is equivalent to the fraction—

(A) $\frac{491}{990}$ (B) $\frac{419}{990}$

(C) $\frac{49}{99}$ (D) $\frac{94}{99}$

69. If $\frac{x}{y} = \frac{3}{4}$, the value of $\frac{6}{7} + \frac{y - x}{y + x}$ is—

(A) 1 (B) $\frac{2}{7}$

(C) $\frac{3}{7}$ (D) $1\frac{3}{7}$

70. The simplified form of $\frac{2}{\sqrt{7} + \sqrt{5}} + \frac{7}{\sqrt{12} - \sqrt{5}} - \frac{5}{\sqrt{12} - \sqrt{7}}$ is—

(A) 5 (B) 2

(C) 1 (D) 0

Answers with Hints

1. (C) 2. (B) 3. (A) 4. Teeth
5. Madam, Mrs. 6. Latest 7. Samaritan
8. Spinster 9. (A) 10. (D) 11. (B)
12. (A) 13. (D) 14. (A) 15. Circular
16. (B) 17. (A) 18. (C) 19. has
20. are

21. (B) Water has maximum density at 4°C. Hence

$$\frac{9}{5}c = F - 32$$

$$\Rightarrow F = \frac{9 \times 4}{5} + 32$$

$$= 7{\cdot}2 + 32 = 39{\cdot}2^\circ F$$

22. (A) According to kinetic theory of gases

$$v_{rms} \propto \sqrt{T}$$

$T = 0$ means $v_{rms} = 0$. Thus, absolute zero temperature is that temperature at which motion of all the molecules of the gas stops. To state that at $T = 0$, $P = 0$, $V = 0$ does not hold because all gases are liquefied before $T = 0$. Moreover $V \neq 0$ due to the volume actually occupied by the molecules.

23. (D) 24. (C)

25. (C) $\phi_0 = h\nu_0 = \frac{hc}{\lambda_0}$

$$= \frac{6{\cdot}6 \times 10^{-34} \times 3 \times 10}{5000 \times 10^{-10}}$$

$$\approx 4 \times 10^{-19} \text{ J.}$$

26. (B) For the first particle

$$v = \sqrt{u^2 + 2gh}$$

For the second particle, initial vertical velocity is zero and final velocity $= \sqrt{2gh}$

Final horizontal velocity $= u$

$$\text{Resultant velocity } v' = \sqrt{\left(\sqrt{2gh}\right)^2 + u^2}$$

$$= \sqrt{u^2 + 2gh}$$

$$= v$$

$$\therefore \quad v : v' = 1 : 1$$