ESE-2017 Objective Paper-I

GENERAL STUDIES AND ENGINEERING APTITUDE

1. Which of the following methods are considered as most favourable to production organizations liable for Taxation?
   1. Straight line method of depreciation
   2. Declining balance method of depreciation
   3. Sum of the years digits method of depreciation
   4. Sinking fund method of depreciation
   Select the correct answer using the codes given below:
   (A) 1 and 2 (B) 2 and 3
   (C) 3 and 4 (D) 4 and 1

   Key: (A)

2. Consider the following statements regarding Repo rate:
   1. It is the rate at which RBI lends money to Commercial Banks generally against Government securities.
   2. It is the rate at which RBI borrows money from Commercial Banks generally against Government Securities.
   3. It is the rate at which Commercial Banks keep Deposits with RBI.
   Which of the above statements is/are correct?
   (A) 1 only (B) 2 only
   (C) 3 only (D) 1, 2 and 3

   Key: (A)

3. Consider the following statements regarding GST:
   1. The GST Bill 2014 has the purpose to improve the value Added Tax on Goods and Services
   2. It can be imposed differently in different States
   3. It is a Comprehensive Tax imposed nationwide irrespective of any State concerned.
   4. It is a significant step in the reform of Indirect Taxation in India.
   Which of the above statements are correct?
   (A) 1, 2 and 3 (B) 1, 2 and 4
   (C) 2, 3 and 4 (D) 1, 3 and 4

   Key: (D)

4. Consider the following statements:
   Vision of Digital India launched by the Government of India is centered on
   1. Digital infrastructure as a utility only to senior citizens
   2. Governance and services on demand
   3. Digital Empowerment of every citizen
   Which of the following statements are correct?
   (A) 1, 2 and 3 (B) 1 and 2 only
   (C) 1 and 3 only (D) 2 and 3 only

   Key: (D)

5. The words 'Satyameva Jayate' inscribed below the base plate of the Emblem of India have been taken from which one of the following?
   (A) Mundaka Upanishad
   (B) The Rig Veda
   (C) The Bhagavad Gita
   (D) Vaalmiki's Ramayana

   Key: (A)

6. Which one of the following Committees was set up by the Government of India in September 2014 to restructure the Railways and to suggest ways for resource mobilization?

(A) Bibek Debroy Committee
(B) C. Rangarajan Committee
(C) Parthasarathi Shome Committee
(D) Sundar Committee

Key: (A)

7. The Rotter dam Convention deals with
(A) Reducing nuclear weapon stock-piles
(B) Limiting the use of toxic chemicals
(C) Protecting the oceans
(D) Banning of human clone experiment

Key: (B)

8. A pentagonal prism is lying on HP on one of its rectangular faces. When it is cut by a section plane, the largest possible section thereof has
(A) Five edges   (B) Six edges
(C) Seven edges   (D) Eight edges

Key: (C)

9. Consider the following tertiary treatment methods for treatment of waste water:
1. Ion-exchange method
2. Reverse osmosis
3. Chemical oxidation method
4. Activated sludge process
Which of the above methods are correct?
(A) 1, 2 and 4   (B) 1, 3 and 4
(C) 2, 3 and 4   (D) 1, 2 and 3

Key: (D)

10. If a thread is wound around a cone, starting from a point on the base, and brought back to the same point, then the shortest possible length of the thread is equal to the
(A) Diameter of the base of the cone
(B) Slant height of the cone
(C) Largest chord of the development sector
(D) Length of the perpendicular from a corner of the development sector to the opposite edge

Key: (C)

11. Three hundred passengers are travelling in white, silver and black cars; each of these cars is carrying 6, 5 and 3 passengers, respectively. If the number of white and silver cars is equal and there is only one black car, what is the total number of cars?
(A) 52   (B) 53   (C) 54   (D) 55

Key: (D)

Sol: Let x, y be the number of white, silver cars respectively then $x = y - (1)$ and
$6x + 5y + 3 = 300$
$\Rightarrow 6x + 5y = 297$
$\Rightarrow 11x = 297 \Rightarrow x = 27$
$\therefore y = 27$
$\therefore$ Total number of cars $= 55$

12. The locus traced by a point moving along a pendulum from one end to another, when the pendulum oscillates, is
(A) A spiral   (B) An involute
(C) A cycloid   (D) A helix

Key: (A)

13. The present ages of 3 brothers are in the proportion 3:4:5. After 10 years the sum of their ages will be 78. What are their ages now?
(A) 12, 16 and 20   (B) 15, 20 and 25
(C) 21, 28 and 35   (D) 24, 32 and 40

Key: (A)

Sol: Let the present ages be $3x, 4x$ and $5x$ respectively then
$(3x + 10) + (4x + 10)(5x + 10) = 78$
$\Rightarrow 12x = 48 \Rightarrow x = 4$
$\therefore$ Ages are 12,16 and 20

14. A total of 324 notes comprising of 20 and 50 denominations make a sum of 12,450. The number of 20 notes is
(A) 200   (B) 144   (C) 125   (D) 110

Key: (C)

Sol: Let x, y be 20 rupee, 50 rupee notes respectively, then

$x + y = 324 - (1)$ and $20x + 50y = 12450$

$\Rightarrow 2x + 5y = 1245 - (2)$

Solving, we get $x = 125, y = 199$

15. Consider the following factors in making ethical judgment:
  1. The motive from which the action springs
  2. The nature of the act itself, including the means adopted
  3. The resulting consequences

Which of the above factors are correct?
  (A) 1 and 2 only   (B) 1 and 3 only
  (C) 1, 2 and 3   (D) 2 and 3 only

Key: (A)

16. If a line is inclined to Vertical Plane and parallel to Horizontal plane, then which of the following statements is always correct?
  (A) True Length = Plane Length
  (B) True Length = Elevation Length
  (C) True Length < Plane Length
  (D) Vertical Trace of the line is above the XY plane.

Key: (A)

17. If the radius of a generating circle which is moving inside the directing circle is half of the radius of the directing circle, the curve generated by a point on the circumference of the generating circle is
  (A) A circle   (B) An ellipse
  (C) A straight line (D) A spiral

Key: (C)

18. If the development of the lateral surface of a cone is a semicircle, then
  (A) The slant height of the cone < diameter of the base of the cone
  (B) The slant height of the cone > diameter of the base of the cone
  (C) The slant height of the cone = diameter of the base of the cone
  (D) The slant height of the cone = radius of the base of the cone

Key: (C)

19. Five Men can paint a building in 20 days, 8 women can paint the same building in 25 days and 10 Boys can paint it in 30 days. If a team has 2 men, 6 women and 5 boys, how long will it take to paint the building?
  (A) 12 days   (B) 13 days
  (C) 14 days   (D) 15 days

Key: (D)

Sol: Let M, W and B be Men, Women, Boy respectively then

$$1 \text{ M- 1 day work} = \frac{1}{20 \times 5} = \frac{1}{100}$$

$$1 \text{ W- 1 day work} = \frac{1}{25 \times 8} = \frac{1}{200}$$

$$1 \text{ B- 1 day work} = \frac{1}{10 \times 30} = \frac{1}{300}$$

All together (i.e., 2M, 6W and 5B) 1 day work

$$\frac{2}{100} + \frac{6}{200} + \frac{5}{300} = \frac{12 + 18 + 10}{600} = \frac{1}{15}$$

Hence, 15 days required to paint the building.

20. The Ethical skills are:
  (A) Care of possessions, modesty, posture, self-reliance, tidy appearance
  (B) Good behaviour, good manners, good relationships, good environment
  (C) Attention, calmness, concentration, self-confidence, self-esteem
  (D) Code of conduct, responsibility, efficiency, perseverance, punctuality

Key: (D)

21. Rajiv spends 40% of his salary on food, 20% on house rent, 10% on conveyance. If his savings at the month end are 2,000, then his monthly salary is
  (A) ₹ 6,000   (B) ₹ 8,000
  (C) ₹ 10,000   (D) ₹12,000

Key: (C)

Sol: Let the monthly salary be 'x' then

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$$\left(40\% \text{ of } x\right)+\left(20\% \text{ of } x\right)$$

$$+\left(10\% \text{ of } x\right)+2000=x$$

$$\Rightarrow \frac{2x}{10}=2000 \Rightarrow x=10000$$

22. A group of workers estimate to finish a work in 10 days, but 5 workers could not join the work. If the rest of them finished the work in 12 days, the number of members present in the team originally is
(A) 50 (B) 45 (C) 35 (D) 30

Key: (D)

Sol: Let x be the number of workers to finish a work in 10 days $\Rightarrow$ 1 day work $=\dfrac{1}{10x}-(1)$

Given $x-5$ workers finish in 12 days

$\Rightarrow$ 1 day work $=\dfrac{1}{12(x-5)}-(2)$

$\therefore$ From (1) and (2), we have

$10x=12(x-5) \Rightarrow x=30$

23. The solution of the system of equations

$x+y+z=4, x-y+z=0, 2x+y+z=5$ is

(A) $x=2, y=2, z=0$ (B) $x=1, y=4, z=1$
(C) $x=2, y=4, z=3$ (D) $x=1, y=2, z=1$

Key: (D)

Sol: $\left[A/B\right] \begin{bmatrix} 1 & 1 & 1 & 4 \\ 1 & -1 & 1 & 0 \\ 2 & 1 & 1 & 5 \end{bmatrix}$

$\begin{matrix} R_2-R_1 \\ R_3-2R_1 \end{matrix} \sim \begin{bmatrix} 1 & 1 & 1 & 4 \\ 0 & -2 & 0 & -4 \\ 0 & -1 & -1 & -3 \end{bmatrix}$

$2R_3-R_2 \sim \begin{bmatrix} 1 & 1 & 1 & 4 \\ 0 & -2 & 0 & -4 \\ 0 & 0 & -2 & -2 \end{bmatrix}$

$x+y+z=4 \Rightarrow -2y=-4 \Rightarrow 2-z=-2$

Solving, we get $x=1, y=2, z=1$

24. A cone is resting with its base on HP. A section plane parallel to VP cuts the cone. The section plane is some distance away from the centre and does not pass through the apex. The true shape of the section is
(A) Hyperbola
(B) Rectangular Hyperbola
(C) Parabola
(D) Rectangular Parabola

Key: (B)

25. The minimum value of the function

$f\left(x\right)=\left(\dfrac{x^3}{x}\right)-x$ occurs at

(A) $x=1$ (B) $x=-1$

(C) $x=0$ (D) $x=\dfrac{1}{\sqrt{3}}$

Key: (A)

Sol: $f'\left(x\right)=0 \Rightarrow x^2-1=0 \Rightarrow x=-1,1$

$f''\left(x\right)=6x>0$ at $x=1$

$\therefore$ Minimum occurs at $x=1$

26. The complete integral of

$\left(z-px-qy\right)^3=pq+2\left(p^2+q\right)^2$ is

(A) $z=ax+by+\sqrt[3]{pq+2\left(p^2+q\right)^2}$

(B) $z=ax+by+\sqrt[3]{ab+2\left(a^2+b\right)^2}$

(C) $z=ax+by+\sqrt[3]{ab}+\sqrt[3]{2\left(a^2+b\right)^2}$

(D) $z=ax+by+c$

Key: (B)

Sol: Given equation can be written as

$z=px+qy+\sqrt[3]{pq+2\left(p^2+q\right)^2}$ is a Clairaut's equation

$\therefore$ Its complete integral is (putting p = a, q = b)

$z=ax+by+\sqrt[3]{ab+2\left(a^2+b\right)^2}$

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27. For the function

$$f(x) = \begin{cases} -2, & -\pi < x < 0 \\ 2, & 0 < x < \pi \end{cases}$$

The value of a_n in the Fourier series expansion of f(x) is

(A) 2   (B) 4   (C) 0   (D) –2

Key: (C)

Sol: Clearly $f(x)$ is odd function

$$\therefore a_n = 0$$

28. The solution of the following partial differential equation $\dfrac{\partial^2 u}{\partial x^2} = 9\dfrac{\partial^2 u}{\partial y^2}$ is

(A) $\sin(3x - y)$ (B) $3x^2 + y^2$

(C) $\sin(3x - 3y)$ (D) $(3y^2 - x^2)$

Key: (A)

Sol: P.D.E is $\dfrac{\partial^2 u}{\partial x^2} = 9\dfrac{\partial^2 u}{\partial y^2}$ — (1)

Let $u = \sin(3x - y) \Rightarrow \dfrac{\partial^2 u}{\partial x^2} = -9\sin(3x - y)$

and $\dfrac{\partial^2 u}{\partial y^2} = -\sin(3x - y)$ $\therefore \dfrac{\partial^2 u}{\partial x^2} = 9\dfrac{\partial^2 u}{\partial y^2}$

$\therefore$ The solution is $\sin(3x - y)$

29. If $W = \phi + i\psi$ represents the complex potential for an electric field. Given, $\Psi = x^2 - y^2 + \dfrac{x}{x^2 + y^2}$, then the function ϕ is

(A) $-2xy + \dfrac{y}{x^2 + y^2} + C$

(B) $2xy + \dfrac{x}{x^2 + y^2} + C$

(C) $-2xy + \dfrac{x}{x^2 + y^2} + C$

(D) $2xy - \dfrac{y}{x^2 + y^2} + C$

Key: (A)

Sol: $\dfrac{\partial \psi}{\partial x} = 2x + \dfrac{y^2 - x^2}{(x^2 + y^2)^2}; \dfrac{\partial \psi}{\partial y} = -2y - \dfrac{2xy}{(x^2 + y^2)^2}$

We have

$$\dfrac{dW}{dz} = \dfrac{\partial \phi}{\partial x} + \dfrac{i\partial \psi}{\partial x}$$

$$= \dfrac{\partial \psi}{\partial y} + \dfrac{i\partial \psi}{\partial x} \; (\because \text{By Cauchy – Riemann's eqn})$$

$$= \left(-2y - \dfrac{2xy}{(x^2 + y^2)^2}\right) + i\left(2x + \dfrac{(y^2 - x^2)}{(x^2 + y^2)^2}\right)$$

By Milne's Thomson method, replacing 'x' by 'z' and 'y' by '0' and integrating with respect to 'z' on both sides

$$\Rightarrow W = \int i\left(2z - \dfrac{1}{z^2}\right) = 2i\dfrac{z^2}{2} + i.\dfrac{1}{z} = i\left(z^2 + \dfrac{1}{z}\right) + C$$

$$\Rightarrow \phi + i\psi = i\left(x^2 - y^2 + 2ixy + \dfrac{x}{x^2 + y^2} - \dfrac{iy}{x^2 + y^2}\right) + C$$

$$= \left(\dfrac{y}{x^2 + y^2} - 2xy\right) + i\left(x^2 - y^2 + \dfrac{x}{x^2 y^2}\right) + C$$

$$\Rightarrow \phi = \left(\dfrac{y}{x^2 + y^2} - 2xy\right) + C$$

30. The residue of $f(z) = \dfrac{z^3}{(z-1)^4 (z-2)(z-3)}$ at z = 3 is

(A) -8   (B) $\dfrac{101}{16}$ (C) 0   (D) $\dfrac{27}{16}$

Key: (D)

Sol: z = 3 **is a simple pole**

$$\therefore \operatorname{Res} f(z) \; \underset{z \to 3}{\operatorname{Lt}} .f(z)$$

$$= \underset{z \to 3}{\operatorname{Lt}} \dfrac{z^3}{(z-1)^4 (z-2)} = \dfrac{27}{16 \times 1} = \dfrac{27}{16}$$

31. The value of the integral $\displaystyle\int_0^{2\pi} \left(\dfrac{3}{9 + \sin^2 \theta}\right) d\theta$ is

(A) $\dfrac{2\pi}{\sqrt{10}}$ (B) $2\sqrt{10}\pi$

(C) $\sqrt{10}\pi$ (D) 2π

Key: (A)

Sol: $\int_0^{2\pi} \dfrac{3}{9+\sin^2\theta}d\theta = 4\int_0^{\pi/2} \dfrac{3}{9+\sin^2\theta}d\theta$

$= 1\int_0^{\pi/2} \dfrac{\sec^2\theta}{\left(9+\sec^2\theta+\tan^2\theta\right)}$

$= 12\int_0^{\infty} \dfrac{1}{10t^2+9}dt$

$= \dfrac{12}{3\sqrt{10}}\left\{\tan^{-1}\left(\dfrac{\sqrt{10}}{3}t\right)\right\}_0^{\infty} = \dfrac{4}{\sqrt{10}}\left(\dfrac{\pi}{2}\right)$

$= \dfrac{2\pi}{\sqrt{10}}$

32. Consider the following statements:
   (i) The failure of many structures
   (ii) Accidents on major highways
   (iii) Discharge of effluents which pollute rivers
   (iv) Dangerous gas emissions
        These are attributable to:
   1. Improper design
   2. Not adhering to proper maintenance practices
   3. Lack of proper inspection and quality control construction
   4. Corruption amongst several concerned individuals
   5. Lack of public concern
   Select the most appropriate answer using the codes given below:
   (A) 1, 2 and 3 only   (B) 1, 2 and 4 only
   (C) 3, 4 and 5 only   (D) 1, 2, 3, 4, and 5

Key: (D)

33. Consider the following statements regarding Golden Ratio for positive integers
   1. It is the ratio of difference of two numbers and the smaller number
   2. It is the ratio of sum of two numbers and the smaller number
   3. It is the ratio of the sum of two numbers and the larger number

Which of the above statements is/are correct?
(A) 1, 2 and 3   (B) 3 only
(C) 2 only   (D) 1 only

Key: (B)

34. For which of the following sectors do comprehensive safety and health statutes, for regulating Occupational Safety and Health (OSH) at work places, exist at present in India?
   (A) Mining, Factories, Ports and Agriculture
   (B) Factories, Mining, Agriculture and Construction
   (C) Mining, Factories, Ports and Construction
   (D) Factories, Ports, Agriculture and Construction

Key: (C)

35. Consider the following statements regarding safety during demolition of a multistory building:
   1. Demolition need not proceed multistorey by storey
   2. Floor openings, not used for material chutes, should be enclosed with adequate guard rails
   3. Before demolition starts all lath and loose plaster shall be stripped off throughout the building
   4. Adequate and well-stiffened lateral bracing shall be provided for walls
   Which of the above statements are correct?
   (A) 1, 2 and 3 only   (B) 1 and 4 only
   (C) 2, 3 and 4 only   (D) 1, 2, 3 and 4

Key: (C)

36. A clutch has to transmit 200 Nm of torque. Assuming uniform pressure theory and the ratio of outer to inner radii is 2.5, what are the radii for a uniform pressure of 2MPa

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with the co-efficient of friction of the liner material being 0.4?

(A) 35mm and 50mm
(B) 20mm and 50mm
(C) 35mm and 80mm
(D) 20mm and 80mm

Key: (B)

37. Consider the goals of the safety policy of a company, at once designating also the responsibilities and authority for their achievement:

1. Safety of employees and the public at large
2. Efforts to be made to involve all managers, supervisors and employees in the development and implementation of safety procedures
3. Clearing of all caveats that may tell on keeping the morale of the employees high

Which of the above statements are correct?

(A) 1, 2 and 3 (B) 2 and 3 only
(C) 1 and 2 only (D) 1 and 3 only

Key: (A)

38. Which one of the following statements is correct in the development of lateral surfaces of solids?

(A) The development of a right cone is a triangle
(B) Triangulation is the recommended method in the development of a prism
(C) The development of the lateral surface of a right circular cylinder is a rectangle
(D) The elements of an elliptical cone are equal in length

Key: (C)

39. A 15kW motor drives a bar of boring machine of 30 mm diameter, twisting it through 0.01 radian, if the shear stress induced is 48MPa and compressive stress is

57MPa, the length of the bar whose $G = 0.80 \times 10^5$ MPa is

(A) 400 mm (B) 350 mm
(C) 300 mm (D) 250 mm

Key: (D)

40. Consider the following statements regarding V-belt drive:

1. The groove angle of the sleeve is less than the belt section angle
2. The efficiency of a V-belt drive is higher than that of a flat belt drive
3. The groove angle is so made that the belt gets wedged in the groove

Which of the above statements are correct?

(A) 1, 2 and 3 (B) 1 and 2 only
(C) 1 and 3 only (D) 2 and 3 only

Key: (C)

41. The purpose of a boring operation in relation to a drilling operation is to

(A) Drill a hole
(B) Finish the drilled hole
(C) Correct the drilled hole
(D) Enlarge the drilled hole

Key: (D)

42. Which of the following types of power have to be pre-justified; and, when the need and occasion arise, must very soon be post-justified?

1. Reward power
2. Coercive power
3. Legitimate power
4. Expert power
5. Referent power

Which of the above statements are correct?

(A) 1, 2 and 3 (B) 1, 2 and 5
(C) 2, 3 and 4 (D) 3, 4 and 5

Key: (A)

43. Factors which govern the operating cost of equipment are:

1. Purchase price of the equipment

2. Depreciation due to regular use

3. Cost of operation, maintenance and repairs

Which of the above statements are correct?

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

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

Key: (C)

44. Consider the following statements with reference to maintenance and service of the product after delivery to the customer:

1. Reliability analysis uses statistics of failures to estimate, understand and improve the performance of the equipment and its maintenance.

2. Reliability analysis records supports or guides the maintenance engineer in improving the performance of the product under service

Which of the above statements is/are correct?

(A) 1 only   (B) 2 only

(C) Both 1 and 2   (D) Neither 1 nor 2

Key: (C)

45. The most fundamental attribute of TQM is

(A) Drawing control charts

(B) Having regular purposeful meetings

(C) Meeting ISO 9000 audit requirements

(D) Direct involvement of top management

Key: (D)

46. Internal audits are used to verify whether:

1. Products conform to technical specifications

2. Quality management systems are effectively implemented

Which of the above statements is/are correct?

(A) 1 only   (B) 2 only

(C) Both 1 and 2   (D) Neither 1 nor 2

Key: (B)

47. Which industrial waste is commonly used in construction industry?

(A) Fly ash   (B) Slag

(C) Sludge   (D) Red oxide

Key: (A)

48. If a square pyramid is freely suspended from one of the corners of its base, then the imaginary line joining that corner with the centre of gravity of the pyramid will be

(A) Inclined at 60° with the vertical

(B) Inclined at 45° with the vertical

(C) Inclined at 30° with the vertical

(D) Vertical

Key: (D)

49. The maximum percentage defects that a consumer may find definitely acceptable is called

(A) AOQL   (B) LTPD

(C) AQL   (D) AOQ

Key: (C)

50. In which one of the following types of industrial activities does the problem of loading and scheduling become more difficult?

(A) Single product continuous

(B) Multi-product continuous

(C) Batch production

(D) Continuous process production

Key: (C)

51. Ethical issues that can affect an Engineer's professional and personal life are termed as

(A) Macro-ethics   (B) Micro-ethics

(C) Morals   (D) Rights

Key: (B)

52. The LEED and GRIHA

1. Are green building rating systems

2. Issue energy compliance certificate

3. Refer to Global standards

4. Are Indian standards under finalization

Select the correct answer using the codes given below:

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

(C) 3 and 4   (D) 1 and 4

Key: (A)

53. Consider the following statements regarding activated sludge process:

1. Industries prefer activated sludge process as it requires less space, does not produce obnoxious odours and requires less time for waste water treatment compared to trickling filter.
2. It requires skilled supervision
3. Biological treatment is enhanced because shock loadings are eliminated

Which of the above statements are correct?

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

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

Key: (D)

54. Consider the following statements regarding ozone:

1. It is continuously being produced and destroyed
2. It helps to sustain life on earth
3. It is formed in the atmosphere through photochemical reaction

Which of the above statements are correct?

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

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

Key: (D)

55. Consider the following statements regarding solar energy:

1. To encourage the adoption of solar energy production, many State Governments and the Centre have announced plans by way of buy back as well as subsidies for installation.
2. Land acquisition of several hectares is a bottleneck in implementing this programme.
3. Considerable R & D effort is needed to bring down the cost of P-V cells.

Which of the above statements are correct?

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

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

Key: (C)

56. If the efficiencies of the boiler, turbine and generator are 85%, 45% and 95% respectively, then the efficiency of the power plant is

(A) 75%   (B) 45%

(C) 36.3%   (D) 28.7%

Key: (C)

Sol: Overall efficiency $=$ Boiler $\eta \times$ Turbine $\eta \times$ Generator η

$= 0.85 \times 0.45 \times 0.95$

$= 0.363$ or 36.3%

57. Which one of the following statements is correct?

(A) The end product of fossil fuels is in the form of electrical energy.

(B) Watershed protection increases the rate of surface run-off of water

(C) If timber is over-harvested, the ecological functions of the forest are improved.

(D) Rivers change their course during floods and lots of fertile soils are lost to the sea

Key: (D)

58. Consider the following statements concerning environmental pollution:

1. Nuclear explosions cause radio-active radiation.
2. Earthquakes do not cause Tsunamis.
3. Acid rain is not a major environmental issue.
4. Air pollution has some impact on meteorology.

Which of the above statements are correct?

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

(C) 3 and 4   (D) 1 and 4

Key: (D)

59. The reasons for low rate of plastic recycling are:
    1. Scrap plastic has little value because virgin material is rather cheap.
    2. Low density of plastic leads to high shipping and handling cost.
    3. Recycling leads to a very severe public health hazard.
    Which of the above reasons are correct?
    (A) 1, 2 and 3   (B) 1 and 2 only
    (C) 1 and 3 only   (D) 2 and 3 only

Key: (D)

60. Consider the following statements regarding internet of things (IoT):
    1. IoT extends the communication via internet to all the things that surround us
    2. IoT is M2M communication.
    3. IoT uses only wireless technology.
    4. The major objectives for IoT are the creation of smart environments/spaces and self-aware things.
    Which of the above statements are correct?
    (A) 1and 3   (B) 2 and 3
    (C) 1 and 4   (D) 2 and 4

Key: (C)

61. Consider the following statements regarding SMOG:
    1. SMOG was coined during the 1950's to describe a mixture of smoke and fog experienced in London.
    2. The principal pollutants in London SMOG are particulates and sulphur compounds.
    3. The London SMOG occurs generally early in the morning on cold wet winter days.
    Which of the above statements are correct?
    (A) 1, 2 and 3   (B) 1 and 2 only
    (C) 1 and 3 only   (D) 2 and 3 only

Key: (A)

62. Besides species diversity and ecosystem diversity, which of the following is included in the term 'bio-diversity'?
    (A) Genetic diversity
    (B) Climatic diversity
    (C) Cultural diversity
    (D) Lingual diversity

Key: (A)

63. Consider the following statements regarding Holostore:
    1. It is a device that reads and writes data in an optical form.
    2. It is a computer storage device.
    3. It refers to Institutions where holography is taught.
    Which of the above statements are correct?
    (A) 1, 2 and 3   (B) 1 and 3 only
    (C) 1 and 2 only   (D) 2 and 3 only

Key: (C)

64. Qualities expected of the manager of a new project are:
    1. Confidence of owner entrepreneur.
    2. Leadership quality and authority.
    3. Quick decision making.
    4. Awareness of jobs completed so far, bottlenecks being faced and funds availability.
    (A) 1, 2 and 3 only   (B) 1, 3 and only
    (C) 2, 3 and 4 only   (D) 1, 2, 3 and 4

Key: (D)

65. The 'Economic life' of a building is considered to be at an end
    1. When the net income from the building fails to justify its existence.
    2. When the building facilities become obsolete.
    3. When the capitalization rate becomes high.
    Which of the above statements are correct?
    (A) 1 and 2 only   (B) 1 and 3 only
    (C) 2 and 3 only   (D) 1, 2 and 3

Key: (A)

66. In a company assembly line, assembling gear boxes, five workers are assigned tasks who take 10, 8, 6, 9 and 10 minutes respectively. The balance delay for this assembly line is
(A) 13.3% (B) 14.0%
(C) 16.0% (D) 43.3%

Key: (B)

67. What is an optimizing strategy?
(A) Strategy of choosing the best possible solution considering all parameters
(B) Strategy of choosing a compromise solution
(C) Strategy of choosing the least cost solution
(D) Strategy of choosing a solution on the basis of precedents

Key: (A)

68. With reference to problem solving, fixation refers to
(A) Focused approach to problem solving
(B) Planned approach to problem solving
(C) Inability to see a problem from a fresh perspective
(D) Inability to comprehend the goals to be achieved

Key: (C)

69. Concurrent engineering is implemented by involving a cross-functional team for design, production, testing and operational work
(A) During the project execution
(B) Long before the project execution
(C) Towards the end of the project execution
(D) After completion of the project execution

Key: (B)

70. Consider the following statements regarding project management:
1. It is the process of attaining project objectives in a stipulated time to produce quantified and qualified deliverables
2. It is the art of bringing together the responsibilites, resources and people necessary to accomplish the business goals and objectives within the specified time limitations and within the financial grant
Which of the above statements is/are correct?
(A) 1 only (B) 2 only
(C) Both 1 and 2 (D) Neither 1 nor 2

Key: (C)

71. What is the full form of GPP ?
(A) Green Public Policy
(B) Green Private Procurement
(C) Green Public Procurement
(D) Green Private Policy

Key: (C)

72. Consider the following phases of project management:
1. Identification
2. Formulation
3. Appraisal
4. Implementation
Which of the above phases are relevant, sequentially?
(A) 1, 2 and 3 only (B) 1, 2 and 4 only
(C) 3 and 4 only (D) 1, 2, 3 and 4

Key: (D)

73. Phenol and formaldehyde are polymerized to a resultant product known as
(A) PVC (B) Bakelite
(C) Polyester (D) Teflon

Key: (B)

74. Consider the following statements concerning e-governance and technology:
1. Rich Site Summary (RSS) is not a very useful tool for working on Web-service technology.

2. Myspace is one of the most visited networks in the world.
3. Facebook.com is not the most useful social networking site of choice for most students.
4. Wiki- is a group collaboration software tool working on Web-service technology.

Which of the above statements are correct?

(A) 1 and 4   (B) 2 and 4
(C) 1 and 3   (D) 2 and 3

Key: (B)

75. Pneumatic structures are:
1. Membrane structures.
2. Stabilized by compressed air.
3. Characterized by internal pressure being less than external pressure.
4. Characterized by internal pressure being equal to or more than external pressure.

Select the correct answer using the codes given below:

(A) 1, 2 and 3   (B) 1, 2 and 4
(C) 2 and 4 only   (D) 1 and 4 only

Key: (B)

76. Consider the following statements regarding water:
1. Water is a polar molecule
2. Water molecules align themselves in an electric field.
3. Water molecules vary their alignment if the applied electric polarity changes with time.
4. Water molecules align themselves in a magnetic field.

Which of the above statements are correct?

(A) 1, 2 and 3 only   (B) 1, 2 and 4 only
(C) 3 and 4 only   (D) 1, 2, 3 and 4

Key: (D)

77. Consider the following assumptions made while developing the ionic packing theory:
1. Cations and anions are spherical but these spheres are not hard.

2. Cations are always smaller than anions.
3. Each cation would tend to be surrounded by the maximum number of anions permitted by geometry.
4. Cations and anions do not touch each other.

Which of the above assumptions are correct?

(A) 1 and 3   (B) 1 and 4
(C) 2 and 4   (D) 2 and 3

Key: (D)

78. Consider the following statements:
1. Asphalt is a naturally occurring product having non-crystalline structure.
2. Rock Asphalt occurs in limestones or sandstones.
3. Tar is a residue left after distillation of crude oil.
4. Resins in Asphalt provide the stickiness to the product.

Which of the above statements are correct?

(A) 1, 2 and 3 only   (B) 3 and 4 only
(C) 1, 2 and 4 only   (D) 1, 2, 3 and 4

Key: (D)

79. Consider the following statements:
1. Baking soda is used in fire extinguishers
2. Quick lime is used in the manufacture of glass

Which of the above statements is/are correct?

(A) 1 only   (B) 2 only
(C) Both 1 and 2   (D) Neither 1 nor 2

Key: (C)

80. In the case of ionic bonding, the molecule is stable as long as the number of bonding electrons is
(A) Equal to the number of antibonding electrons
(B) Less than the number of antibonding electrons

(C) Greater than the number of antibonding electrons

(D) Equal to the number of antibonding neutrons

Key: (B)

81. A resistor measures 4Ω at $40^0 C$ and 6Ω at $80^0 C$. At $0^0 C$ the resistor will measure

(A) 1.5Ω (B) 2Ω

(C) 3Ω (D) 4Ω

Key: (B)

Sol: We have formula for temperature coefficient of resistance as

$R_T = (1 + \alpha T)R$ where R_T = Resistance at any temperature

α = Constant of material

R=Resistance at zero degree

At $40^O C$

$R_{40} = (1 + 40\alpha)R = 4\Omega$ ...(1)

At $80^O C$

$R_{80} = (1 + 80\alpha)R = 6\Omega$ ...(2)

At $0^O C$

$R_0 = (1 + 0.\alpha)R = R$

$\therefore R_0 = R$ ...(3)

$\dfrac{(1)}{(2)} = \dfrac{1+40\alpha}{1+80\alpha} = \dfrac{4}{6}$

$6 + 240\alpha = 4 + 320\alpha$

$6 - 4 = 320\alpha - 240\alpha$

$2 = 80\alpha \Rightarrow \alpha = \dfrac{2}{80} = 0.025$

Substitute value α in equation (1)

$(1 + 40\alpha)R = 4 \Rightarrow \left(1 + 40 \times \dfrac{2}{80}\right)R = 4$

$2R = 4 \Rightarrow R = \dfrac{4}{2} = 2\Omega$

82. Fatigue resistance of materials can be improved by:

1. Shot peening

2. Polishing the surface

Which of the above is/are correct?

(A) 1 only   (B) 2 only

(C) Both 1 and 2   (D) Neither 1 nor 2

Key: (C)

83. Consider the following statements on 'firewall' used in computing systems:

1. It controls and monitors the data traffic flow between inside and outside network.

2. It protects and secures the inside network from any outside network.

3. It can be implemented in software or hardware or a combination of both.

Which of the above statements are correct?

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

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

Key: (D)

84. Consider the following as advantages of ICT tools in educational systems:

1. Increased capacity and cost effectiveness of the educational system.

2. Achievement by target groups that had limited access to traditional education.

3. Support for improvement of the quality and relevance of existing structures of education.

4. Provision of links between various educational institutions for knowledge sharing.

Which of the above statements are correct?

(A) 1, 2 and 3 only   (B) 1, 2 and 4 only

(C) 3 and 4 only   (D) 1, 2, 3 and 4

Key: (D)

85. How is the closeness or commonness of attitude, behavior, trust and performance within the organization designated?

(A) Cohesion   (B) Morale

(C) Communication   (D) Leadership

Key: (C)

86. Accessibility legislation is intended to
(A) Protect intellectual property
(B) Improve the usability of websites
(C) Make all websites easier to use for visually impaired people
(D) Improve access to services for disabled people in both the physical and the virtual worlds

Key: (D)

87. PRAGATI is the acronym
(A) Pro-active governance and transparency in India
(B) Pro-active governance and timely implementation
(C) Primary governance for transparency in India
(D) Promoting and accomplishing governance with assured and timely implementation

Key: (B)

88. The main goal of G2B (Government to Business) is
1. To increase productivity by giving more access to information.
2. To lower the cost of doing business.
3. To create more transparency.
Select the correct answer using the codes given below:
(A) 1 and 2 only (B) 1 and 3 only
(C) 2 and 3 only (D) 1, 2 and 3

Key: (D)

89. In a software project, COCOMO (Cost Constructive Model) is used to estimate
(A) Effort and duration based on the size of the software
(B) Size and duration based on the effort of the software
(C) Effort and cost based on the size of the software
(D) Size, effort and duration based on the cost of the software

Key: (C)

90. If a clock loses 5 seconds per day, What is the alteration required in the length of the pendulum in order that the clock keeps correct time?

(A) $\frac{4}{86400}$ times its original length be shortened

(B) $\frac{1}{86400}$ times its original length be shortened

(C) $\frac{1}{8640}$ times its original length be shortened

(D) $\frac{4}{8640}$ times its original length be shortened

Key: (C)

Directions: *Each of the next **ten(10)** items consists of two statements one labeled as the 'Statement-I' and the other as 'Statement-II'. Examine these two statements carefully and select the answers to these items using the codes given below.*

Codes:
(A) Both Statements-I and Statements-II are individually true and Statement -II is the correct explanation of Statement-I
(B) Both Statements-I and Statements-II are individually true but Statement-II is NOT the correct explanation of Statement-I
(C) Statement-I is true but Statement-II is false
(D) Statement-I is false but Statement-II is true

91. Statement (I): Global warming is the cause for climate change.
Statement (II): Ozone depletion will cause global warming.

Key: (C)

92. Statement (I): Graph between potential energy of spring versus the extension or compression of the spring is a straight line.

Statement (II): Potential energy of a stretched or compressed spring, is directly proportional to square of extension or compression.

Key: (D)

93. **Statement (I):** Fatigue failure is a stress which is lower than the yield strength of a metal.
    Statement (II): Repeated straining lowers the yield strength.

Key: (A)

94. **Statement (I):** Physical properties of composite materials are generally isotropic.
    Statement (II): The stiffness of composite panel will often depend upon the orientation of the applied forces and/or moments.

Key: (D)

95. **Statement (I):** Environmental considerations are not necessarily the same as, or congruent with, Ecological considerations.
    Statement (II): Environmental considerations address more towards maintaining, whereas Ecological considerations address more towards sustaining.

Key: (A)

96. **Statement (I):** Manganese is always added to steels since it combines with the sulphur content to form manganese sulphide.
    Statement (II): If manganese is not added, iron sulphide which is not harmful for steel, would form.

Key: (C)

97. **Statement (I):** Quality Circle is a method to bring Organizational improvement through indulging the workers.
    Statement (II): The main aim of Quality Circle is self-development and mutual development of grass root level employees.

Key: (A)

98. **Statement (I):** Digital India is a program to transform India into a digitally empowered society.
    Statement (II): Digital India is a program to institute smart cities.

Key: (C)

99. **Statement (I):** Increased cloud cover will lead to warmer winters due to clouds reflecting more intense solar energy.
    Statement (II): Overcast cloud conditions result in decrease in the day-night temperature difference.

Key: (D)

100. **Statement (I):** Engineers shall hold paramount the safety, health and welfare of the public while performing their professional duties.
     Statement (II): Engineers shall continue their professional development throughout their careers.

Key: (B)

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