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ESE 2024 : Prelims Exam | GS & ENGINEERING CLASSROOM TEST SERIES | APTITUDE

Test 21

Full Syllabus Test 5 : (Paper-I)

ANSWER KEY

1. (b)	21. (b)	41. (d)	61. (a)	81. (b)
2. (c)	22. (c)	42. (b)	62. (b)	82. (b)
3. (b)	23. (d)	43. (c)	63. (b)	83. (b)
4. (d)	24. (c)	44. (c)	64. (b)	84. (c)
5. (d)	25. (d)	45. (d)	65. (d)	85. (c)
6. (c)	26. (c)	46. (a)	66. (c)	86. (c)
7. (c)	27. (b)	47. (b)	67. (b)	87. (a)
8. (b)	28. (c)	48. (c)	68. (b)	88. (d)
9. (b)	29. (d)	49. (c)	69. (b)	89. (b)
10. (b)	30. (d)	50. (b)	70. (c)	90. (c)
11. (a)	31. (b)	51. (c)	71. (d)	91. (d)
12. (a)	32. (b)	52. (c)	72. (d)	92. (a)
13. (d)	33. (b)	53. (a)	73. (d)	93. (b)
14. (d)	34. (a)	54. (d)	74. (c)	94. (b)
15. (d)	35. (b)	55. (a)	75. (c)	95. (a)
16. (b)	36. (c)	56. (b)	76. (b)	96. (b)
17. (b)	37. (a)	57. (b)	77. (b)	97. (a)
18. (d)	38. (b)	58. (c)	78. (c)	98. (c)
19. (d)	39. (a)	59. (d)	79. (b)	99. (b)
20. (b)	40. (d)	60. (a)	80. (a)	100. (b)

Note : Q.91 Answer key and Explanation updated

DETAILED EXPLANATIONS

2. (c)

Neo banks are financial institutions with only an online presence and function digitally. They offer all traditional bank services via a digital setup or mobile apps without having any physical branches. These are 100% digital banks. They cannot apply for a banking license. The expertise of these neo banks lies in tying technology and artificial intelligence together to offer personalized financial services to customers. It is offered at a minimal cost. Neo banks offer limited products like savings accounts, small loans, debit cards, etc. and not all services of banks.

3. (b)

- The Telecom Regulatory Authority of India (TRAI) was established with effect from 20th February 1997 by an Act of Parliament, called the Telecom Regulatory Authority of India Act, 1997, to regulate telecom services, including fixation/revision of tariffs for telecom services which were earlier vested in the Central Government.
- TRAI's mission is to create and nurture conditions for growth of telecommunications in the country in a manner and at a pace which will enable India to play a leading role in emerging global information society.
- One of the main objectives of TRAI is to provide a fair and transparent policy environment which promotes a level playing field and facilitates fair competition.

4. (d)

The labour force participation rate (LPR) is a measure of the proportion of a country's working-age population that is actively engaged in the labour market. The unemployment rate is the percentage of unemployed workers in the total labour force.

7. (c)

- NASA has launched a spacecraft called 'Psyche' on a six-year mission to study a unique metal-rich asteroid also named 'Psyche.'
- This asteroid orbit the Sun between Mars and Jupiter.
- The primary goal of the Psyche mission is to explore the iron core, a previously unexplored aspect of planet formation.
- For the first time, the mission will examine a celestial body primarily composed of metal rather than rock and ice.
- Additionally, it aims to gain insights into the internal structure of terrestrial planets, including Earth, by directly studying the interior of a differentiated body, which would otherwise remain hidden.

9. (b)

- In the Global Hunger Index (GHI) 2023, India has been ranked 111th out of 125 countries, indicating a serious level of hunger.
- The GHI score is based on four indicators, including under-nourishment, child stunting, child wasting, and child mortality.

- The Global Hunger Index (GHI) is an annual report that measures and tracks hunger at the global, regional, and country levels.
- The GHI's goal is to trigger action to reduce hunger around the world

10. (b)

Emotional dishonesty, in authenticity and falseness create distrust and tension in society.

17. (b)

- Due to Greenhouse gas emissions, global warming is already 1°C higher than the pre-industrial levels. There is vast evidence that this has serious consequences for ecosystems and human being.
- The IPCC's special report on Oceans and Cryosphere (published in 2019) reveals that the ocean is 0.8 degrees warmer than the preindustrial age.
- It is more acidic, and less productive because of the carbon emission that was sunk by the oceans. The impact of ocean warming would be an increase in the frequency of tropical cyclone winds and rainfall, as well as an increase in extreme waves, all of which would be accompanied by a rise in relative sea level.

20. (b)

In saturated hydrocarbons complete combustion of the fuel takes place but in the unsaturated hydrocarbons incomplete combustion takes place. Hence saturated hydrocarbons give a blue flame while unsaturated hydrocarbons burn with a sooty flame.

22. (c)

TRAFFIC is a leading non-governmental organisation working globally on trade in wild animals and plants in the context of both biodiversity conservation and sustainable development.

23. (d)

- The UN Framework Convention on Climate Change (UNFCCC), the 1994 international agreement that lays down the broad principles of the global effort to fight climate change, explicitly acknowledges this differentiated responsibility of nations. It makes it very clear that rich countries must provide both the finance and the technology to the developing nations to help them tackle climate change. It was after much struggle that the developing countries and NGOs managed to establish a separate channel on loss and damages at international climate change negotiations.
- The Warsaw International Mechanism (WIM) for Loss and Damages, set up in 2013, was the first formal acknowledgment of the need to compensate developing countries struck by climate disasters.

25. (d)

- International Big Cats Alliance (IBCA) will focus on the protection and conservation of seven major big cats of the world, including tiger, lion, leopard, snow leopard, puma, jaguar and cheetah, with membership of the range countries harbouring these species.
- Project Tiger was launched by the Central government on April 1, 1973, in a bid to promote conservation of the tiger.

- Launched at the Jim Corbett National Park, the programme was initially started in nine tiger reserves of different States such as Assam, Bihar, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Uttar Pradesh and West Bengal, covering over 14,000 sq km. Notably, Project Tiger didn't just focus on the conservation of the big cats. It also ensured the preservation of their natural habitat as tigers are at the top of the food chain.

27. (b)

- Carbon sequestration is a crucial part of the global carbon cycle, as it is the process of capturing and storing atmospheric carbon dioxide. One of the ways this happens is when forests and other land vegetation absorb carbon dioxide during photosynthesis.
- According to a 2014 NASA-led study, tropical forests remove up to 30 per cent of human carbon dioxide emissions from the atmosphere and make for an important carbon sink – an area which absorbs more carbon than releases it. Therefore, they have a significant role in keeping global temperatures low.

31. (b)

Developing WBS to low levels provides better control.

32. (b)

LOB technique is used for project management activities where a finite number of deliverables must be produced in a given time period.

33. (b)

Slack is measured within activities whereas lag is measured between activities.

37. (a)

$$\begin{aligned}\text{Present value of perpetual annuity} &= A \times \frac{1}{i} \\ &= 2500 \times \frac{1}{0.15} = \text{Rs.}16667\end{aligned}$$

38. (b)

- Radius vector is the line joining any point on the curve with the pole.
- Vectorial angle is the angle between the line, at any instant, and its initial position.

39. (a)

The word single-stroke does not mean that the lettering should be made in one stroke without lifting the pencil. It means that the thickness of the letter should be uniform such as it obtained in one stroke of the pencil. Single stroke letters may be:

1. Capital letters (Upper case)
2. Small letter (Lower case)

41. (d)

Rapid prototyping (RP) is a technology that produces prototypes directly from computer-aided design (CAD) models in a fraction of the time required to make them by machining or moulding methods. Another name for RP is solid freeform fabrication. RP is used for producing the final

proof-of-concept model and is used extensively in embodiment design to check form, fit and function.

42. (b)

Exciters : It is often called as delighters, these are product features that make the product unique and distinguish it from the competition. Note that the absence of an exciter will not make customers unhappy, since they do not know that is missing.

43. (c)

Line of intersection between a plane surface and a curve surface of two solids such as prism and cylinder is a curve.

44. (c)

General guidelines that can be followed to prevent slips and trips are as follows:

- Clean up spills and leaks immediately.
- Sand icy spots immediately and walk carefully.
- Use slip-resistance floor waxes and polishes in offices and high traffic areas.
- Put up signs or barriers to keep people away from temporary slip hazards.
- Wear shoes with anti-skid soles.
- Avoid turning sharply when walking on slippery surfaces

45. (d)

Hazards and Operability Studies (HAZOP) is the most widely used method of analysis used in the process industries. Hazard and Operability Studies (HAZOP's) are structured critical examinations of plant or processes undertaken by an experienced team of company staff in order to identify all possible deviations from an intended design, along with the consequent undesirable effects concerning safety, operability and the environment. The possible deviations are generated by rigorous questioning, prompted by a series of standard 'guide words' applied to the intended design.

Advantage of HAZOP:

- Most systematic and comprehensive of methodologies.
- Can be used in conjunction with Human Error analysis.

Disadvantage of HAZOP:

- Can be time consuming and costly.
- Can be tedious if not well facilitated.

46. (a)

The PDCA cycle was originally conceived by Walter Shewart in the 1930s, and later adopted by W.Edwards Deming. The model provides a framework for the improvement of a process or system.

47. (b)

Statist model (1950 - 1970s) : Under the aegis of Jawaharlal Nehru, this model came into being in the post-independence era. The era was driven by a mixed and socialist kind of economy. The important feature of this model was that state ownership and legal requirements decide corporate responsibilities.

48. (c)

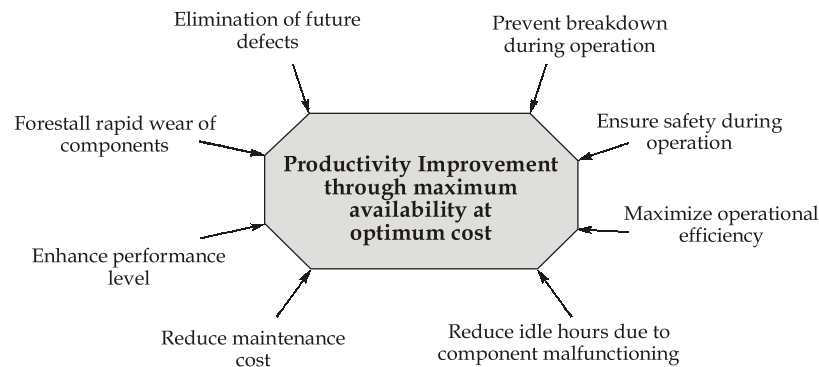


Fig. Objectives of maintenance

50. (b)

The probability that the component will not fail in 12000 hours is, $R(12000) = e^{-\lambda t}$
 $= e^{-0.0002 \times 12000} = e^{-2.4}$

52. (c)

Sound CSR practices help companies attract and retain quality investors and business partners.

53. (a)

- TOFD is an advanced NDT method used for weld inspection. It is one of the most reliable NDT methods in testing welds for both pre-service and in-service inspection.
- To overcome the limitations of the pulse echo method, ultrasonic TOFD developed.
- It has higher accuracy for measuring the through-wall size crack like defects and can be performed in a wide range of material thickness.

55. (a)

- The emissive displays are devices that convert electrical energy into light. Examples are Plasma Panel, thin film electroluminescent display and LED (Light Emitting Diodes).
- The CRT display is made up of small picture elements called pixels. There are small little dots which make up the image on computer display (LCD or CRT). This screen is divided into a matrix of thousands or even millions of pixels. The smaller the pixels, the better the image clarity or resolution.

56. (b)

Registers are the fastest type of memory in a computer system. They are located directly within the CPU, which allows for extremely quick access to the contents. They are used to store data and instructions that are needed immediately and frequently.

57. (b)

Personal Area Networks (PANs) are small, short-range networks that connect devices within the immediate vicinity of a person, typically within a range of 10 meters or less. Bluetooth and Near Field Communication (NFC) are examples of PANs.

58. (c)

- CDMA is a spread spectrum technique. Each data bit is spread by a code sequence which allows for multiple users to share the same frequency band concurrently.
- 5G has significantly lower latency to deliver more instantaneous, real-time access than 4G.

59. (d)

The Point of Sale (POS) terminal is basically an electronic cash register used for realizing a retail transaction. They are widely used in various businesses, including retail stores, restaurants, hotels, and many more. It functions as a cash register, computer terminal, and OCR reader.

61. (a)

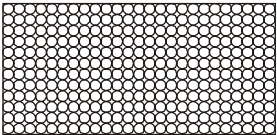
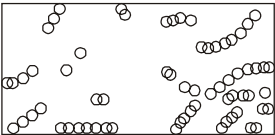
- Advanced materials are new materials with enhanced properties that are intentionally designed for superior performance and are utilized in high-technology (or high-tech) applications.
- CSIR-Advanced Materials and Processes Research Institute (AMPRI), Bhopal has converted red mud into X-ray shielding tiles in a green and economically viable manner.

62. (b)

- Charle's law states that the volume of an ideal gas is directly proportional to the absolute temperature at constant pressure i.e. $\frac{V}{T} = \text{constant}$.
- Boyle's Law states that for a fixed mass of gas at a constant temperature, the volume is inversely proportional to pressure.
- Gay-Lussac's Law states that at constant volume, the pressure of a fixed amount of a gas varies directly with temperature.
- Avogadro's Law states that at constant temperature and pressure, all equal volumes of gases will have an equal number of molecules.

63. (b)

Differences between crystalline and non-crystalline solids:

Crystalline solid		Non-crystalline solid	
1.	The arrangement of atoms is in a periodically repeating manner as shown below: 	1.	It possesses entangled chain of atoms without any periodicity as shown below: 
2.	It has high density due to closed packing of atoms in the structure.	2.	It has lower density as the packing of atoms takes place in a zig-zag manner.
3.	It presents a sharp diffraction pattern.	3.	It does not present any sharp diffraction pattern.
4.	It exhibits a pin-pointed melting temperature.	4.	It melts over a range of temperatures.
5.	It has well-defined crystal structure and geometries.	5.	It has varying structure and geometries.

64. (b)

- Fullerene consists of 20 hexagons and 12 pentagons, which are arrayed such that no two pentagons share a common side and the molecular surface thus exhibits the symmetry of a soccer ball.
- In solid state, the C_{60} units form a crystalline structure and pack together in a face-centered cubic array.

65. (d)

In most of the vulcanization process, we add sulphur compounds to the heated elastomer. In this process, chains of sulphur atoms bond with adjacent polymer backbone chains crosslink them. Because the vulcanized materials are crosslinked, so these materials are thermosetting in nature.

66. (c)

Creep is characterized by the gradual and permanent deformation of a material subjected to a constantly applied stress. It occurs at lower stresses than that of rupture strength.

67. (b)

- α -ferrite is magnetic below 768°C and its magnetic properties disappear above 768°C .
- The solubility of carbon in δ -ferrite is very less but it is more than that of α -ferrite.
- Martensite is the most hard and brittle phase of iron.

68. (b)

Here,

$$\chi_m = 3.7 \times 10^{-3}$$

and

$$H = 10^4 \text{ A/m}$$

So

$$\begin{aligned} M &= \chi_m H = 3.7 \times 10^{-3} \times 10^4 \\ &= 37 \text{ A/m} \end{aligned}$$

69. (b)

The loss tangent is given by,

$$\tan \delta = \frac{\epsilon_r''}{\epsilon_r'} = \frac{1.5}{2.25} = 0.66$$

70. (c)

The materials, having high malleability allow smooth conduction in transmission and distribution. The materials having high ductility help in producing wires flexibly for conduction.

71. (d)

Let \vec{b} is the initial length of Burger vector, then after cold working length of Burger vector will be $\vec{b} + 2\vec{b} = 3\vec{b}$.

As we know that,

$$\text{Energy required to move dislocation} = \frac{Gb^2}{2}$$

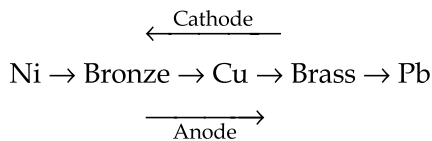
Hence, energy required to further move dislocation $\propto (3b)^2$ or $9b^2$

Hence, energy required will be $\frac{9Gb^2}{2}$

72. (d)

The Galvanic series plays a vital role in preventing corrosion. The material selection can be done effectively so that the metals with least tendency to undergo a galvanic reaction can be chosen. The wider the separation between the two metals in the Galvanic series, the more severe is the corrosion of more active metal among them.

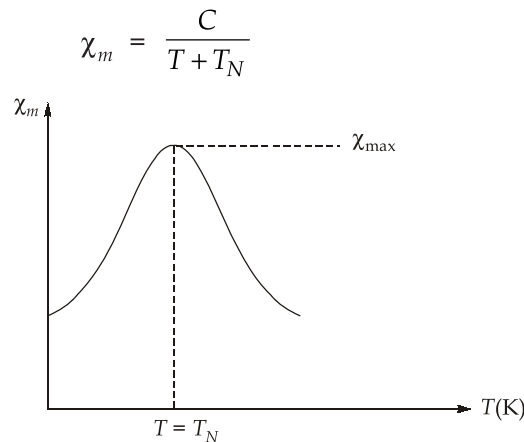
Galvanic series order of given materials:



Hence, when brass is acting as cathode, lead (Pb) can be used as anode to reduce corrosion.

73. (d)

The susceptibility of a ferromagnetic material decreases above the Neel temperature and it becomes paramagnetic in nature.



At Neel temperature, susceptibility is maximum.

74. (c)

$$f(x) = \sin^4 x$$

Also,

$$f(-x) = \sin^4(-x) = \sin^4 x = f(x)$$

So,

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^4 x \, dx = 2 \int_0^{\frac{\pi}{2}} \sin^4 x \, dx = 2 \int_0^{\frac{\pi}{2}} \left(\frac{1 - \cos 2x}{2} \right)^2 dx$$

$$= \frac{1}{2} \int_0^{\frac{\pi}{2}} (1 + \cos^2 2x - 2 \cos 2x) dx$$

$$\Rightarrow \frac{1}{2} \int_0^{\frac{\pi}{2}} \left(1 - 2\cos 2x + \frac{1 + \cos 4x}{2} \right) dx$$

$$\Rightarrow \frac{1}{4} \int_0^{\frac{\pi}{2}} (3 - 4\cos 2x + \cos 4x) dx$$

$$\Rightarrow \frac{1}{4} \left[3x - \frac{4\sin 2x}{2} + \frac{\sin 4x}{4} \right]_0^{\frac{\pi}{2}}$$

On solving, we get $\frac{3\pi}{8}$.

75. (c)

Here binomial distribution can be used

$$P(H) = 0.5$$

Probability of getting head exactly 4 times is given by

$$\begin{aligned} P(X = 4) &= {}^5C_4 (0.5)^4 (0.5)^1 \\ &= 5 \times (0.5)^5 \\ &= \frac{5}{32} \end{aligned}$$

76. (b)

Let's take C be any skew symmetric matrix of order 2×2 i.e. $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$.

Assume, $X = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ then $X^T = [x_1 \ x_2]$

$$\begin{aligned} \text{So, } X^T C X &= [x_1 \ x_2] \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \\ &= [x_2 - x_1] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \\ &= [x_1 \ x_2 + (-x_1 \ x_2)] \\ &= \text{Zero} \end{aligned}$$

77. (b)

$$\text{Given: } I = \int_0^{\infty} \frac{dx}{e^x + e^{-x}} = \int_0^{\infty} \frac{e^x dx}{1 + e^{2x}}$$

Put,

$$e^x = t$$

\therefore

$$e^x dx = dt$$

\therefore

$$I = \int_1^{\infty} \frac{dt}{1 + t^2} = \left[\tan^{-1} t \right]_1^{\infty} = \frac{\pi}{2} - \frac{\pi}{4} = \frac{\pi}{4}$$

78. (c)

$$\therefore I = \begin{bmatrix} 2 & 6 & 0 \\ 4 & 12 & 8 \\ -2 & 0 & 4 \end{bmatrix}$$

Given: $|I| = -96$

We have, $|A| = \begin{vmatrix} 4 & 12 & 0 \\ 8 & 24 & 16 \\ -4 & 0 & 8 \end{vmatrix} = 2 \times 2 \times 2 \begin{vmatrix} 2 & 6 & 0 \\ 4 & 12 & 8 \\ -2 & 0 & 4 \end{vmatrix}$

$$|A| = 8|I|$$

$$|A| = 8 \times (-96)$$

$$|A| = -768$$

79. (b)

Probability that A speaks truth $P(A) = 0.7$

Probability that B speaks truth $P(B) = 0.9$

$$P(\bar{A}) = 0.3, P(\bar{B}) = 0.1$$

Hence, the probability that they will contradict to each other = $P(\bar{A})P(B) + P(A)P(\bar{B})$

$$= 0.3 \times 0.9 + 0.7 \times 0.1$$

$$= 0.27 + 0.07 = 0.34 = 34\%$$

80. (a)

Given,

$$y = \sqrt{\cos x + \sqrt{\cos x + \sqrt{\cos x + \dots + \infty}}}$$

$$y = \sqrt{\cos x + y}$$

$$y^2 = \cos x + y$$

$$y^2 - y = \cos x$$

Differentiating w.r.t. x , we get

$$2y \frac{dy}{dx} - \frac{dy}{dx} = -\sin x$$

$$(1 - 2y) \frac{dy}{dx} = \sin x$$

81. (b)

Curve 1:

$$y^2 = 16x$$

Curve 2:

$$x^2 = 16y$$

Intersection points of curve 1 and 2,

$$y^2 = 16x = 16\sqrt{16y} = 64\sqrt{y}$$

$$y^4 = 64 \times 64 \times y$$

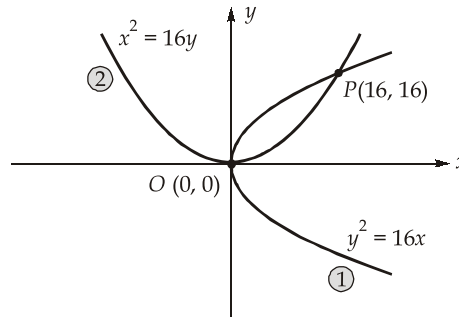
$$y^3 = 64 \times 64$$

$$\Rightarrow y = 0 \text{ and}$$

$$\text{and } y = 16 \text{ and } y = 0$$

It gives, $x = 16$ and $x = 0$

Therefore, intersection points are $P(16, 16)$ and $O(0, 0)$. The area enclosed between curves 1 and 2 are given by



$$\begin{aligned}
 \text{Area} &= \int_{x_1}^{x_2} y_1 dx - \int_{x_1}^{x_2} y_2 dx \\
 &= \int_0^{16} \sqrt{16x} dx - \int_0^{16} \frac{x^2}{16} dx \\
 &= 4 \left[\frac{x^{3/2}}{3/2} \right]_0^{16} - \left[\frac{x^3}{48} \right]_0^{16} = \frac{8}{3} [64 - 0] - \frac{1}{48} [16^3 - 0] \\
 &= 170.66 - 85.33 = 85.33 \text{ sq. units}
 \end{aligned}$$

82. (b)

A parallelogram requires 2 pairs of parallel lines. If a parallelogram has m horizontal and n vertical

lines, then total number of parallelograms possible $= {}^nC_2 \times {}^mC_2 = \frac{n!}{2!(n-2)!} \times \frac{m!}{2!(m-2)!}$

Here, $n = 4$ and $m = 3$

So, total number of parallelograms $= {}^4C_2 \times {}^3C_2$

$$= \frac{4!}{2!2!} \times \frac{3!}{2!1!} = \frac{4 \times 3 \times 2!}{2!2!} \times \frac{3 \times 2!}{2!} = 3 \times 6 = 18$$

83. (b)

$$\begin{aligned}
 \text{Let} \quad & \log_{1024} 8 = m \\
 \Rightarrow & (1024)^m = 8 \\
 \Rightarrow & (2^{10})^m = 2^3 \\
 \Rightarrow & (2)^{10m} = 2^3 \\
 \Rightarrow & 10m = 3 \\
 \Rightarrow & m = \frac{3}{10} = 0.3
 \end{aligned}$$

84. (c)

In the question, the circle represents Noble, triangle represents Hindi and Rectangle represents Poet, then Noble Poet who can't speak Hindi are represented by area enclosed by both circle and rectangle but not triangle. So, 6 is the only element.

85. (c)

Let original GDP was x

$$\text{Then, its international value} = \frac{x}{70}$$

GDP in rupees grew at 6%

$$\text{Therefore, GDP becomes } \frac{106x}{100}$$

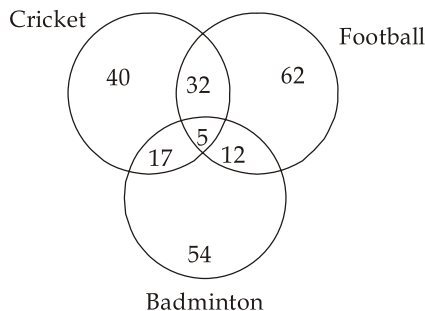
USD increased from Rs. 70/USD to Rs. 72/USD

$$\text{Therefore, its international value is } \frac{106x}{100} \times \frac{1}{72} = \frac{106x}{7200}$$

$$\text{So, the percent change} = \left(\frac{\frac{106x}{7200} - \frac{x}{70}}{\frac{x}{70}} \right) \times 100 = 3.05\%$$

Since percentage is positive, GDP got increased by $3.05 \simeq 3\%$.

86. (c)



According to question, Venn diagram is shown as above.

So, total number of students those participated in games

$$= 40 + 62 + 54 + 32 + 12 + 17 + 5 = 222$$

Since participated students are only 40% of the total strength.

So, let total no. of students in the college were x .

$$\text{So, } \frac{40}{100} \times x = 222$$

$$x = 222 \times \frac{10}{4} \quad x = 555$$

87. (a)

$$\text{Total expenditure} = 700 \times 5 = 3500 \text{ million}$$

$$\text{and Total revenue} = 500 + 700 + 800 + 600 + 400 = 3000 \text{ million}$$

Then total profit or loss (in %) on the total expenditure

$$= \left(\frac{\text{Revenue} - \text{Expenditure}}{\text{Expenditure}} \right) \times 100$$

$$= \frac{3000 - 3500}{3500} \times 100 = \frac{-500}{3500} \times 100 = -\frac{1}{7} = 14.28\% \text{ (loss)}$$

88. (d)

Here,

$$P = 5^2 = 25$$

$$Q = 6^2 = 36$$

$$R = 7^2 = 49$$

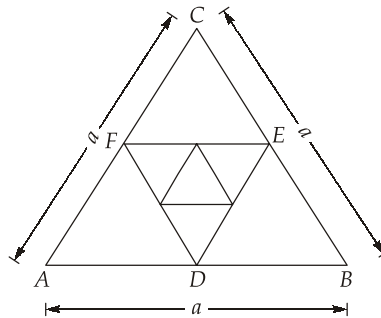
$$S = 8^2 = 64$$

$$T = 9^2 = 81$$

So,

$$Q + S = 36 + 64 = 100$$

89. (b)



Let a be the side length of initial triangle, i.e.,

$$AB = BC = AC = a$$

We have,

$$DE = EF = DF = \frac{a}{2}$$

Similarly for next triangle,

$$\text{Side} = \frac{a}{4}$$

$$\begin{aligned} \text{Sum of areas} &= \frac{\sqrt{3}}{4}(a)^2 + \frac{\sqrt{3}}{4}\left(\frac{a}{2}\right)^2 + \frac{\sqrt{3}}{4}\left(\frac{a}{4}\right)^2 + \dots \\ &= \frac{\sqrt{3}}{4}(a)^2 \left[1 + \frac{1}{2^2} + \frac{1}{2^4} + \frac{1}{2^6} + \dots \right] \end{aligned}$$

$$= \frac{\sqrt{3}}{4} a^2 \times \frac{1}{1 - \frac{1}{4}} = \frac{\sqrt{3}a^2}{4} \times \frac{4}{3} = \frac{a^2}{\sqrt{3}}$$

90. (c)

Let the person's speed be x m/s and that of escalator be y m/s.

We have, $x + y = \frac{100}{5} = 20 \text{ m/s}$... (i)

$x - y = \frac{100}{25} = 4 \text{ m/s}$... (ii)

From equation (i) and (ii)

$$x = 12 \text{ m/s}$$

$$y = 8 \text{ m/s}$$

When the person is not running on the escalator, time required to reach the top = $\frac{100}{8} = 12.5$ seconds

91. (d)

$$\text{Profit in year 2017} = 270 - 225 = 45 \text{ lakhs}$$

$$\text{Profit in year 2018} = 261 - 225 = 36 \text{ lakhs}$$

$$\text{Profit in year 2019} = 448 - 400 = 48 \text{ lakhs}$$

$$\text{Profit in year 2020} = 750 - 675 = 75 \text{ lakhs}$$

98. (c)

Statement II is false.

Resource constraints usually occur under multi-tasking situations but not necessarily.

99. (b)

File transfer protocol (FTP) is a way to download, upload, and transfer files from one location to another on the Internet and between computer systems.

100. (b)

- DigiLocker is a "digital locker" service operated by the Government of India that enables Indian citizens to store official documents on the cloud. The service is aimed towards reducing the need to carry physical documents, and is a part of Digital India initiative.
- A URI is generated by an issuer department which issues documents directly to the DigiLocker account. This unique URI can be resolved to a full URL (Uniform Resource Locator) to access the actual document in its appropriate repository.

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