

**ANSWERS**

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

1. (b)  
Top-down method are slow and not suitable for large scale production.
2. (a)  
Quartz crystal is piezoelectric but not pyroelectric. Hence it is not ferroelectric.
3. (b)  
Ferrimagnetic material has low eddy current loss. Soft magnetic material has low coercivity hence its systems loss is low. Where as hard magnetic material has high coercivity hence its hysteresis loss is high.
4. (a)  
A material is termed as advanced composite if fibres are directional and continuous. Reinforced fibre glass products are strong and light weight. In concrete, reinforced steel rebar is dispersed phase and not matrix phase. Pearlitic steels are composite where ferrite is matrix phase and cementite is reinforcement.
5. (b)
- Granite is used for rough stone work.
  - Marble is used for ornamental work
  - Chalk can be used as ballast
6. (d)  
The atomic radius is of the order of  $10^{-10}$  to  $10^{-14}$  m whereas Nano means  $10^{-9}$  m whose order of dimension is higher and nano materials do exist in the form of rods, tubes, spheres etc. Nano elements under goes nano technology in which manipulation of materials are done and processed at the nanoscale level. Such as carbon nanotube etc. Moreover, nano elements exhibit prominent electrical, magnetic, optical characteristics and these materials can be processed through rolling etc.
7. (a)  
Slip occurs most readily in directions that have the shortest steps, and along planes that are farthest apart. The latter are automatically the planes that are most densely populated.
8. (b)  
When atoms are moved from one site to another, bonds are broken and reconstituted. During transition, an activation energy is required to distort the lattice. Small solute atoms, low melting-point solvents, and lower atomic packing factors in a lattice all require a lower activation energy. Hence, activation energy for diffusion is directly proportional to the packing factor.
9. (a)  
Using a computational basis of four atoms,  $(1 \text{ Mg}^{2+} + 1 \text{ O}^{2-}) = (24 + 16) + (56 + 16) = (40 + 72)$ .
10. (b)  
Cyber bullying is when the internet is used on a device to hurt people or embarrass them. It is as the title indicates, bullying via internet. It can be done by groups or an individual abusing the system.  
Cyber-bullying can be as simple as continuing to send e-mail to someone who has said they want no further contact with the sender, but it may also include threats, sexual remarks and hate speech. The practice of cyber-bullying is not limited to children nd, while the behavior is identified by the same definition in adults.
11. (c)  
NPCI is a not-for-profit company formed by various banks, with primary objective of providing cost-effective payment Solution to the banks to rely on expensive contracts of Visa, Mastercard, Infosys etc). NPCI's Solution such as IMPS, BHIM, RuPay etc. have indeed helped in financial inclusion.  
NPCi launched Rupay card in 2012, as 7th payment gateway in the world.
12. (d)  
In case of UPI, there is transaction limit which varies from bank to bank but in the majority of banks, it is not more than 1 lakh while in case of other modes of transfer like internet banking, RTGS there is no limit and an individual can transfer any amount which he or she wants.  
Transaction can only be done if a person has bank account as to make a UPI account one needs to have a bank account.  
It is difficult to pay through the card in small cities. Most of the merchants don't have the card swiping machine.

13. (b)  
 Educational software such as GCompris and programming interfaces such as Scratch have been found to be very useful in building the learning capabilities and communication skills of autistic children.  
 A person with mobility impairment can use technology with adaptive keyboard featuring keys that are four times bigger or mouse alternatives such as the Trackball Mouse to operate a computer.
14. (c)  
 A wide area network is a telecommunications network or computer network that extends over a large geographical distance/place.
15. (a)  
 Once data has been written into ROM chip it cannot be removed and it can only be read. RAM is also known as RWM (i.e. Read Write Memory). RAM needs to be writeable in order for it to do its job of holding programs and data that you are working on.
16. (b)  
 Secondary memory is a non-volatile memory (does not lose stored data when the device is powered down).
17. (a)  
 The speed of Supercomputer are measured and benchmarked in Floating Points Operations per Second (FLOPS).
18. (b)  
 Smart TV should not be confused with Internet TV, IPTV or Web television. Internet TV refers to receiving television content over the Internet instead of traditional systems (terrestrial, cable and satellite) (although Internet itself is received by these methods).  
 Web television is a term used for programs created by a wide variety of companies and individuals for broadcast on Internet TV.
19. (c)  
 This act of parliament of India which equips a person to report against corrupt and illegal activities in the Government or private organization to the higher authorities concerned.

20. (a)  
 Green-washing involves falsely conveying to consumers that a given product, service, company or institution factors environmental responsibility into its offerings and/or operations.
21. (a)  
 A code of ethics is a guide of principles designed to help professionals conduct business honestly and with integrity. A code of ethics document may outline the mission and values of the business or organization, how professionals are supposed to approach problems, the ethical principles based on the organization's core values and the standards to which the professional is held.
22. (a)  
 Business ethics (also known as corporate ethics) is a form of applied ethics or professional ethics, that examines ethical principles and moral or ethical problems that can arise in a business environment. It applies to all aspects of business conduct and is relevant to the conduct of individuals and entire organizations.
23. (b)  
**Benefits of Citizen Charters**
- Enhance accountability by providing citizens with a clear understanding of service delivery standards, including timetables, user fees for services, and options for grievance redress.
  - Increase organizational effectiveness and performance by making a public commitment to adhere to measurable service delivery standards.
  - Create a way for both internal and external actors to objectively monitor service delivery performance.
  - Create a more professional and client-responsive environment for service delivery.
  - Foster improvements in staff morale.
  - Decrease opportunities for corruption and graft by increasing transparency and educating citizens about their rights.
  - Increase government revenues by ensuring that the money citizens pay for services goes into the government's coffers (and not into

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employees' pockets).

24. (a)

#### Factors behind Corruption in India

1. **Colonial-legacy** of unchallenged authority and propensity to exercise power arbitrarily. In a society which worships power, it is easy for public officials to deviate from ethical conduct
2. **Asymmetry of power** in our society. Nearly 90% of our people are in the unorganized sector. And nearly 70% of the organized workers with job security and regular monthly wage are employed by the state directly or through public sector undertaking. Such asymmetry of power reduces societal pressure to conform to ethical behaviour and makes it easy to indulge in corruption.
3. **Opportunity**: In the pre-LPG era, the over regulation, severe restrictions on economic activity, excessive state control, near-monopoly of the government in many sectors and an economy of scarcity all created conditions conducive to unbridled corruption.

Many state subsidies and beneficiary-oriented programmes enhanced opportunities to indulge in corruption and reduced the citizens' capacity to resist extortionary demands.

25. (b)

#### Probity Principles

There are several generally accepted probity principles that serve to maintain the integrity of a process. These are:

1. **Accountability**: Accountability is the obligation to be able to explain or account for the way duties have been performed. Government should have appropriate mechanisms in place to show that they are accountable for their practices and decisions.
2. **Transparency**: It is important that the process is transparent to the maximum extent possible so that all stakeholders can have confidence in the outcomes. Transparent, open processes also minimise the opportunity for, and the risk of, fraud and corruption.
3. **Confidentiality**: As a condition of employment, all public servants are under a

general obligation of confidentiality to their employer. Accordingly, it is not necessary for members of the Government Project Team who are public servants to execute a confidentiality undertaking in relation to the project. All Government advisors, members and any other third party that is privy to commercially sensitive information must provide a formal undertaking to Government that they will keep this information confidential.

4. **Management of Conflicts of Interest**: A conflict of interest arises where an individual associated with the process is, through their particular associations or circumstances, influenced, or perceived to be influenced, to obtain an unfair advantage for him or herself or another party. Conflicts of interest are often unavoidable.

However, provided they are identified early and dealt with effectively, they need not prejudice the process. It is important to ensure that individuals associated with the process are aware of how a conflict of interest arises and their responsibilities to report conflicts ensure conflicts are adequately addressed, and ensure the manner in which they have been addressed is adequately documented.

26. (d)

#### Components of a Citizen's Charter:

A good Citizen's Charter should have the following components:-

- (i) Vision and Mission Statement of the Organisation.
- (ii) Details of Business transacted by the Organisation.
- (iii) Details of 'Citizens' or 'Clients'.
- (iv) Statement of services including standards, quality, time frame etc. provided to each Citizen/ Client group separately and how/ where to get the services.
- (v) Details of Grievance Redress Mechanism and how to access it.
- (vi) Expectations from the 'Citizens' or 'Clients'.
- (vii) Additional commitments such as compensation in the event of failure of service delivery.

27. (d)
28. (b)  
 The virgin vegetation, which are purely Indian are known as endemic or indigenous species but those which have come from outside India are termed as exotic plants.
29. (b)  
 Gulf of Mannar- Tamil Nadu  
 Nanda Devi- Uttarakhand  
 Nokrek - Meghalaya  
 Simlipal - Odisha
30. (b)  
 Biomes - It is a community of plants and animals that have common characteristics for the environment they exist in.  
 Ecology – It is the environment as it relates to living organisms.  
 Ecosystem – It is a system formed by interaction of a community or organisms with physical environment.
31. (a)  
 West Bengal government has given its approval to State Forest Department to apply for coveted Ramsar Site recognition under Ramsar Convention to Sunderban Reserve Forest. Now, State Forest Department through Central Government will apply to Ramsar Convention Secretariat.
32. (c)  
*Lichens* are widely used as *environmental* indicators or bio-indicators. If *air* is very badly *polluted* with sulphur dioxide there may be no *lichens* present, just green algae may be found.  
 If the *air* is clean, shrubby, hairy and leafy *lichens* become abundant.
33. (b)  
 The greenhouse effect is a natural occurrence that allows the Earth to maintain a temperature suitable for supporting life. The greenhouse gases within the atmosphere behave in a way similar to a pane of glass in a greenhouse.
34. (d)
35. (d)

36. (c)  
 The Australia Group is an informal group to help member countries identify those exports which need to be controlled so as not to contribute to the spread of chemical and biological weapons.  
 It has 42 members including the European Commission, all 28 member states of the European Union, Ukraine, and Argentina. The group follows two policies:
1. No undercut: It states that any member of the group considering making an export to another state that had already been denied an export by any other member of the group must first consult with that member state before approving the export.
  2. Catch all: It states that member states should halt all exports that could be used by importers in chemical or biological weapons programs, regardless of whether export is on the group's control lists.
37. (a)  
 It comes under the Swachh Bharat Abhiyan of Indian Government and measures eight major pollutants namely: **a.** Particulate Matter (PM 10 and PM 2.5), **b.** Nitrogen dioxide, **c.** Sulphur dioxide, **d.** Ozone, **e.** Carbon monoxide, **f.** Ammonia and **g.** Lead.
38. (b)  
 Bank rate is the rate at which central bank (in case of India, it is RBI) of a country provides re-financing facilities or provides loans to the commercial banks.  
 When bank rate is lowered, it is called 'cheap money policy'. Money supply in the economy is increased. Commercial banks now can borrow from the RBI at cheaper rates and if you want to get a home loan, your cost of getting that loan gets decreased.  
 RBI lowers the bank rate during a period of recession/slowdown or sluggish economic activity. Reduced costs of loans, encourage companies/manufacturing units etc to borrow more for increasing production and consumers to spend more. Thus, it enhances the economic activity in the country.
39. (c)

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Not all bioplastics are biodegradable. One of the advantages of bioplastics is that no adverse change to flavour or scent in food stored in bioplastic containers.

40. (a)

It is an initiative of Ministry of Sports and Youth affairs

Traditional games like Kabaddi and Kho-Kho are part of the programme. Talented players identified in priority sports disciplines at various levels will be provided annual financial assistance of INR 5 lakh per annum for 5 years.

41. (a)

Pandit Deen Dayal Upadhyay Unnat Krishi Shiksha Yojana is being implemented by Indian Council of Agricultural Research (ICAR).

It was launched in 2016 to include trained farmers of the field of Organic Farming/Natural Farming/ Cow Based Economy for training and capacity building of other farmers of nearby areas.

Under this scheme 100 training centers were proposed to be opened for agricultural education.

Objectives:

- To build skilled Human Resource at village level relevant to national needs towards organic farming and sustainable agriculture.
- To provide rural India with professional support in the field of Organic Farming/ Natural Farming/ Rural Economy/ Sustainable Agriculture.

42. (c)

“Paramparagat Krishi Vikas Yojana” is an elaborated component of Soil Health Management (SHM) under National Mission of Sustainable Agriculture (NMSA).

Under this scheme, fifty or more farmers form a cluster having 50 acre land to take organic farming. Each farmer will be provided Rs. 20000 per acre in three years for seed to harvesting crops and to transport them to market

Beneficiaries: Farmers doing organic farming, Farmers from North East India such as Sikkim, Food processing industries and Organic foods – export industry

Objectives: (a) Promotion of commercial organic production through certified organic farming. (b) Pesticide residue free produce

and improved health of consumer. (c) Raise farmer's income and create potential market for traders.

43. (a)

Ayushman Bharat-National Health Protection Scheme is world's largest government-funded healthcare scheme. It cover over 10 crore poor and vulnerable families (approximately 50 crore beneficiaries). It has a defined benefit cover of Rs 5 lakh per family (on a family floater basis) per year for secondary and tertiary care hospitalisation.

44. (b)

It was created in 2006 and was initially published by the International Food Policy Research Institute (IFPRI) and Welthungerhilfe. Irish NGO Concern Worldwide also became a co-publisher of the index in 2007.

It has 4 component indicators: 1) the proportion of the undernourished as a percentage of the population; 2) the proportion of children under the age of five suffering from wasting; 3) the proportion of children under the age of five suffering from stunting; 4) the mortality rate of children under the age of five.

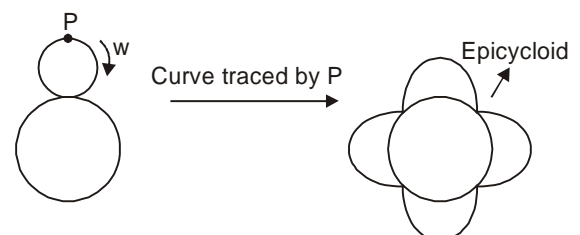
45. (c)

A trochoid is curve traced by a point situated either inside or outside the circle, which rolls along a fixed straight line without slipping. If the tracing point situated outside the rolling circle, the curve is called as Superior trochoid.

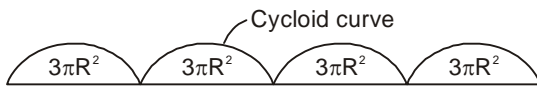
46. (a)

The parametric equation of the epicycloid is given by

$$\begin{aligned}
 x &= (R+r)\cos\theta - r\cos\left(\frac{R+r}{r}\theta\right) \\
 y &= (R+r)\sin\theta - r\sin\left(\frac{R+r}{r}\theta\right)
 \end{aligned}
 \left. \begin{array}{l} R \rightarrow \text{radius of the} \\ \text{directing circle} \\ r \rightarrow \text{radius of the} \\ \text{generating circle} \end{array} \right\}$$



47. (b)



Area under one loop of the cycloid curve =  $3\pi R^2$

$\therefore R = 1$  unit

$\Rightarrow$  Area under one loop of the curve =  $3\pi$  units

Area given =  $18\pi$  units

$\Rightarrow$  No. of loops =  $\frac{18\pi}{3\pi} = 4$

48. (c)

49. (d)

50. (d)

51. (d)

52. (d)

53. (a)

54. (d)

55. (a)

56. (c)

57. (d)

58. (d)

59. (c)

60. (d)

61. (d)

62. (c)

Independent float can be utilized without affecting its preceding or succeeding activities.

63. (d)

64. (b)

65. (a)

Cost reduction opportunity is mostly available at the conceptual definition phase of a product development life cycle as most of the decision regarding design, scope, quality, specification etc.

Which affects the product cost is taken during this phase.

66. (b)

General policy for A class items in ABC control are:

- Very strict control
- Frequent review of their consumption
- No safety stock the inventory has to be kept minimum as these items are very costly.

67. (d)

68. (d)

Factors considered for production scheduling are component design, route sheets and time standards. Sales forecast is an input to master production schedule.

69. (b)

Cost of advertising to select vendor comes under ordering cost.

70. (a)

71. (d)

72. (a)

In the given system of equations the ratio of the coefficients of x equals the ratio of the coefficients of y.

They would be consistent only if this ratio equals the ratio of the constant terms

$$\therefore \text{if } \frac{10}{k} = \frac{2}{6} = \frac{-5}{-15} \text{ i.e.,}$$

if  $k = 30$ , the given system of equations would be consistent.

73. (c)

$$P = \begin{bmatrix} 4 & 1 \\ 1 & 2 \end{bmatrix}, P^{-1} = \frac{1}{7} \begin{bmatrix} 2 & -1 \\ -1 & 4 \end{bmatrix}$$

$$\therefore D = \frac{1}{7} \begin{bmatrix} 2 & -1 \\ -1 & 4 \end{bmatrix} \begin{bmatrix} 3 & -4 \\ 2 & -6 \end{bmatrix} \begin{bmatrix} 4 & 1 \\ 1 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} 2 & 0 \\ 0 & -5 \end{bmatrix}$$

74. (b)

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$$f(x) = \begin{cases} \frac{-x \sin x}{x}, & x < 0 \\ \frac{x \sin x}{x}, & x \geq 0 \end{cases}$$

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

$$\text{Now, } f'(0^+) = \lim_{h \rightarrow 0} \frac{f(0+h) - f(0)}{h}$$

$$= \lim_{h \rightarrow 0} \frac{\sin h - 0}{h} = \lim_{h \rightarrow 0} \frac{\sin h}{h} = 1$$

$$\text{and } f'(0^-) = \lim_{h \rightarrow 0} \frac{f(0-h) - f(0)}{-h}$$

$$= \lim_{h \rightarrow 0} \frac{-\sin(-h) - 0}{-h} = \lim_{h \rightarrow 0} \frac{-\sin h}{h} = -1$$

Since,  $f'(0^+) \neq f'(0^-)$ , hence  $f(x)$  is not differentiable at  $x = 0$ .

$$\text{But } \lim_{x \rightarrow 0} f(x) = \lim_{x \rightarrow 0^-} f(x) = \lim_{x \rightarrow 0^+} f(x) = 0$$

Hence it is continuous.

Thus A1 is true but A2 is false.

75. (d)

$$\lim_{x \rightarrow \infty} \frac{x^{-1} + x^{-4}}{x^{-2} + x^{-3}} = \lim_{x \rightarrow \infty} \frac{\left(\frac{1}{x} + \frac{1}{x^4}\right) \times x^2}{\left(\frac{1}{x^2} + \frac{1}{x^3}\right) \times x^2}$$

$$= \lim_{x \rightarrow \infty} \frac{x + \frac{1}{x^2}}{1 + \frac{1}{x}} = \frac{\infty + 0}{1 + 0} = \infty$$

76. (d)

$$f(x) = x^5 - 5x^4 + 5x^3 - 1$$

$$f'(x) = 5x^4 - 20x^3 + 15x^2$$

$$f''(x) = 20x^3 - 60x^2 + 30x$$

Now for critical points,  $f'(x) = 0$

$$\Rightarrow 5x^2(x^2 - 4x + 3) = 0$$

$$\Rightarrow x^2(x-3)(x-1) = 0$$

$$x = 0, 1, 3$$

Now  $f''(0) = 0$

$$f''(1) = -10 < 0$$

$$f''(3) = 20 \times 27 - 60 \times 9 = 90 > 0$$

Since  $f''(1) < 0$ , hence  $f(x)$  has a point of maxima at  $x = 1$

77. (b)

Now, Let  $M(t, x) = 2t(xe^{t^2} - 1), N(t, x) = e^{t^2}$

$$\frac{\partial M}{\partial x} = 2te^{t^2} = \frac{\partial N}{\partial t}$$

Hence the given differential equation is exact.

Thus the solution of the given differential equation is

$$\int M(t, x) dt + \int 0 \cdot dx = c$$

$$\Rightarrow xe^{t^2} - t^2 = c$$

78. (a)

TE  $\propto O(h^2)$  (by definition)

79. (a)

Probability density function

$$f(x) = \begin{cases} \frac{1}{(10-7)}, & [7 \leq x \leq 10] \\ 0, & \text{otherwise} \end{cases}$$

$$P(7.4 \leq X \leq 9.5) = \int_{7.4}^{9.5} \frac{dx}{3} = \frac{2.1}{3} = 0.7$$

80. (b)

Let  $\theta$  be the angle between the two vectors, Then

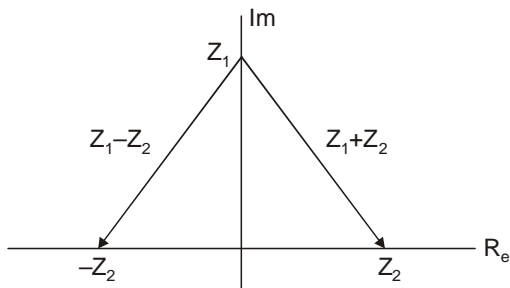


$$\cos \theta = \frac{\vec{A} \cdot \vec{B}}{|\vec{A}| |\vec{B}|}$$

$$\Rightarrow \cos \theta = \frac{3-7}{\sqrt{52}\sqrt{8}} = \frac{-4}{4\sqrt{26}}$$

$$\Rightarrow \theta = \cos^{-1}\left(\frac{-1}{\sqrt{26}}\right)$$

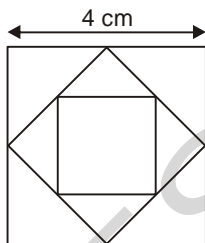
81. (c)



$$|Z_1 + Z_2| = |Z_1 - Z_2|$$

Therefore the difference of the amplitudes of  $Z_1$  and  $Z_2$  is  $90^\circ$ .

82. (a)



Area of outer most square =  $4^2$

Area of immediate inner square =  $(2\sqrt{2})^2$

Area of next immediate inner square =  $2^2$

Sum of areas of all squares

$$= 4^2 + (2\sqrt{2})^2 + 2^2 + \dots$$

$$= 16 + 8 + 4 + 2 + \dots$$

$$= \frac{16}{1 - \frac{1}{2}} = 32 \text{ cm}^2$$

So option (a) is correct

83. (c)

$$\left(x^2 + \frac{1}{x^2}\right)^2 = x^4 + \frac{1}{x^4} + 2$$

$$x^2 + \frac{1}{x^2} = \sqrt{121}$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 11$$

$$\left(x - \frac{1}{x}\right)^3 = x^3 - \frac{1}{x^3} - 3\left(x - \frac{1}{x}\right)$$

$$\Rightarrow \left(x - \frac{1}{x}\right)^3 + 3\left(x - \frac{1}{x}\right) = x^3 - \frac{1}{x^3} \quad \dots(1)$$

$$\text{Now } \left(x - \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} - 2$$

$$\left(x - \frac{1}{x}\right)^2 = 9$$

$$\left(x - \frac{1}{x}\right) = 3$$

From (1)

$$3^3 + 3 \times 3 = x^3 - \frac{1}{x^3}$$

$$\Rightarrow x^3 - \frac{1}{x^3} = 36$$

So option (c) correct.

84. (c)

Part of the job completed by P and 1 day =  $\frac{1}{20}$

Part of the job completed by Q and 1 day =  $\frac{1}{30}$

Part of the job completed by P and Q in a day

$$= \frac{1}{20} + \frac{1}{30} = \frac{1}{12}$$

suppose that the remaining work is completed in  $x$  days.



Then  $x\left(\frac{1}{12}\right) + 10\left(\frac{1}{20}\right) = 1$

$x = 6$  days.

85. (a)

Let the speed of trains be  $x$  m/sec and  $y$  m/sec with  $x > y$ .

Moving in same direction,

$$\Rightarrow \frac{300 + 200}{x - y} = 100$$

$$5 = x - y \quad \dots(1)$$

Moving in opposite direction

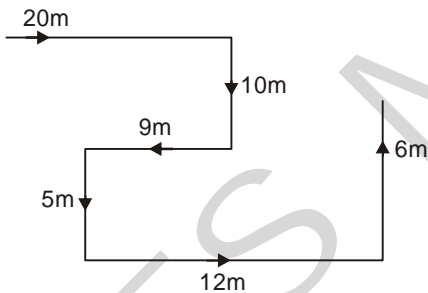
$$\frac{300 + 200}{x + y} = 20$$

$$25 = x + y \quad \dots(2)$$

Solving (1) and (2) we get  $x = 15$  m/sec

$y = 10$  m/sec

86. (b)



Dog facing north direction so option (b) is correct.

87. (d)

P R O T E I N  
1 2 3 4 5 6 7

R T I N E O P  
2 4 6 7 5 3 1

Similarly PRODUCT is coded as RDCTUOP

88. (d)

Angle between hour hand and minute hand is  $\theta$

$$= \left| \frac{11}{2}m - 30h \right|$$

$$\frac{11}{2}m = \theta + 30h$$

$$11m = 2\theta + 60h$$

Taking  $\theta = 62^\circ$

$$11m = 2 \times 62 + 62 \times 5$$

$$11m = 424$$

$m = 38$  min past 5 O'clock the two hands of the clock are  $62^\circ$  apart.

Taking  $\theta = -62^\circ$

$$\theta = 30h - \frac{11}{2}m$$

$$\Rightarrow m = \frac{176}{11}$$

$\Rightarrow$  At 16 min past 5 O'clock the two hands of clock are  $62^\circ$  apart

89. (c)

$$|x - 2|^2 + |x - 2| = 2$$

$$|x - 2| = t$$

$$t^2 + t - 2 = 0$$

$$t^2 + 2t - t - 2 = 0$$

$$t(t + 2) - 1(t + 2) = 0$$

$$t = +1 \quad t = -2$$

$$t > 0 \text{ as } |x - 2| > 0$$

$$|x - 2| = 1$$

$$\Rightarrow x - 2 = \pm 1$$

$$x = 3$$

$$x = 1$$

sum of roots = 4

So option 'c' is correct

90. (a)

Required unit digit = unit digit of  $4^{102} + 4^{103}$

Now  $4^2$  gives unit digit 6.

$\Rightarrow 4^{102}$  gives unit digit 6.

$\Rightarrow 4^{103}$  gives unit digit of the product  $6 \times 4$  i.e., 4

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Hence unit digit of  $264^{102} + 264^{103} =$  unit digit of  $(6 + 4)$   
 $= 0$

91. (d)

$M \times N \rightarrow M$  is father of  $N$

$N - C \rightarrow N$  is sister of  $C$

and  $C + F \rightarrow C$  is brother of  $F$

Hence,  $M$  is father of  $C$ , or  $C$  is son of  $M$

92. (b)

Ceramic tools have very brittle tool tips, that is why they all prone to impact loads, there tools are used on hard to machine work material such as cast iron as they are highly wear and abrasion resistance.

93. (c)

Only certain character written in a standard format can be read. These characters are converted into a form that computer can understand and then stored in a file.

94. (d)

There are many types of whistle-blowing internal whistle blowing, anonymous whistle blowing, open whistle-blowing and external whistle-blowing.

95. (c)

Child marriage and practice of sati was once considered positive morality because mistakenly insufficient evidence was discovered and brought

forward in an intelligent way to affect the understanding of people by highlighting the possible risk.

It is not the result of deeper reflection and dialogue and it is based on assumption and acceptance without reason.

96. (a)

The soils also vary over space. Different types of soils provide basis for different types of vegetation. The sandy soils of the desert support cactus and thorny bushes, while wet, marshy, deltaic soils support mangroves and deltaic vegetation. The hill slopes with some depth of soil have conical trees.

97. (c)

Protection is granted not only to the flora and fauna of the protected region, but also to the human communities who inhabit these regions and their ways of life.

98. (b)

- Affinity diagram is last stage of brainstorming where different ideas are recorded.
- But sketchstorming records the data in visual form. Here both statement are correct but not explaining each other.

99. (a)

100. (d)

Objective and constraints are not interchangeable.

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