



# ACE

## Engineering Academy

TEST ID: 512

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**Test-22**

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### **FULL LENGTH MOCK TEST-3 (PAPER-I) SOLUTIONS**

**01. Ans: (c)**

**Sol:**

- As per the World Gold Council's (WGC) data, India has 618.2 tonnes of the yellow metal as holdings, which is 6.9 per cent of the share held in gold in total foreign reserves. United States (US) has the largest holding with 8133.5 tonnes, followed by Germany with 3366 tonnes and the International Monetary Fund (IMF) with 2814 tonnes.
- India has pipped the Netherlands to move into the list of top ten countries in terms of total gold reserves.
- In terms of individual countries, India actually ranks ninth since the International Monetary Fund (IMF) occupies the third position after the U.S. and Germany.

**02. Ans: (a)**

**Sol:** Fordow Nuclear Facility is an underground Iranian uranium enrichment centre located 32 km of the Iranian city of Qom. Iran had initially declared that Fordow nuclear facility has about 3000 centrifuges. Iran had shut down the Fordow nuclear plant last year accepting the condition to stop all kinds of Uranium enrichment. Iran has started reversing its commitments step-by-step

since May this year, after announcing its withdrawal from the US nuclear agreement.

**03. Ans: (d)**

**04. Ans: (d)**

**Sol:** The India CCS is one of the first that fully aligns itself with the newly adopted WHO 13th General Programme of Work and its 'triple billion' targets, the Sustainable Development Goals (SDGs) and WHO South-East Asia Region's eight Flagship Priorities.

It captures the work of the United Nations Sustainable Development Framework for 2018–2022.

WHO 'Triple Billion' targets:

It is a strategic plan for the next five years.

It aims for:

- One billion more people to be benefitted from Universal Health Coverage (UHC)
- One billion more people to be protected from health emergencies
- One billion more people to be covered for better health and well-being.

**05. Ans: (a)**



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**06. Ans: (a)**

**Sol:**  $M = 2.8 \text{ A/m}$ ,  $\chi_0 = 0.0025$

$$B = \mu_0 (H + M)$$

$$= \mu_0 \left( \frac{H}{M} + 1 \right) M = \mu_0 \left( \frac{1}{\chi_0} + 1 \right) M$$

$$= 4\pi \times 10^{-7} \times 2.8 \left( \frac{1}{0.0025} + 1 \right)$$

$$= 1.41 \times 10^{-3} \text{ Wb/m}^2$$

**07. Ans: (b)**

**Sol:** Statement (3) is incorrect, only some of piezo electric material are ferro electric material.

**08. Ans: (c)**

**Sol:** Plane fractions =  $\alpha, \alpha, \frac{-1}{2}$

Reciprocals =  $0, 0, \bar{2}$

Miller Indices =  $(0,0,\bar{2})$

**09. Ans: (a)**

**Sol:** Analysis and design stages are concerned with identification of right procedures, technologies, identification of need, opportunities in the market etc. The primary question to be answered in these stages is about the correctness of procedures or right procedures, hence called as verification.

**10. Ans: (a)**

**11. Ans: (b)**

**Sol:** In case of conflicts, morals are given high importance since conflicts rise in individuals and are to be resolved by an individual.

**12. Ans: (c)**

**Sol:** Morals, ethics and law share common factor about what is right and what is wrong or what is good and what is bad or what is permissible and impermissible. (c) I correct answer.

Self is the moral agent for punishments in case of morals; group evaluates conduct in case of ethics while judiciary is an independent agency for illegal actions. Domain of evaluation is not the same in each of these domains. Therefore (a) and (b) are not the answers.

**13. Ans: (d)**

**Sol:** RAM is volatile in nature so it does not store permanent memory which is stored by secondary storage  
Start up routine is stored by ROM.

**14. Ans: (a)**

<b>Sol: Size</b>	<b>Equal to</b>
8 bits	1 Byte
1024 Bytes (210)	1 Kilobyte
1024 Kilobytes (220)	1 Megabyte
1024 Megabytes (230)	1 Gigabyte
1024 Gigabytes (240)	1 Terabyte
1024 Terabytes (250)	1 Petabyte
1024 Petabytes (260)	1 Exabyte

**15. Ans: (a)**

**Sol:** [NepaliSat-1](#) satellite was launched by Nepal successfully from Virginia in the United States on 18 April, 2019. Its aim is to gather detailed geographical information of the Himalayan nation.

**16. Ans: (c)**

**Sol:** This policy aims at facilitating creation of secure computing environment and enabling adequate trust and confidence in electronic transactions and also guiding stakeholder's action for protection of cyber space.

**17. Ans: (c)**

**Sol:** Computers process only digital signal

So, option (a) is correct

So, option (c) is incorrect

Option (b) software set of instructions that process the data

Option (d) is also correct



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**18. Ans: (c)**

**Sol:** "SERVQUAL" scores cannot be used to compare companies from different sectors.

**19. Ans: (a)**

**Sol:** According to 80-20 rule (pareto chart) significant improvement is possible by eliminating first significant few reasons.

**20. Ans: (a)**

**Sol:** Pure randomness indicates that process is stable (in control). Therefore, we can continue the process.

**21. Ans: (d)**

**Sol:**

- State/Union Territories
- Mangrove Sites
- West Bengal 1. Sunderbans
- Odisha 1. Bhaitarkanika 2. Mahanadi 3. Subarnarekha 4. Devi 5. Dhamra 6. Mangrove Genetic Resources Centre 7. Chilka
- Andhra Pradesh 1. Coringa 2. East Godavari 3. Krishna
- Tamil Nadu 1. Pichavaram 2. Muthupet 3. Ramnad 4. Pulicat 5. Kazhuvelli
- Andaman & Nicobar 1. North Andamans 2. Nicobar
- Kerala 1. Vembanad 2. Kannur (Northern Kerala)
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- Goa 1. Goa
- Maharashtra 1. Achra-Ratnagiri 2. Devgarj-Vijay Durg 3. Veldur 4. Kundalika-Revdanda 5. Mumbai-Diva 6. Vikhroli 7. Shreevardhan 8. Vaitarna 9. Vasai-Manori 10. Malvan
- Gujarat 1. Gulf of Kutch 2. Gulf of Khambhat 3. Dumas-Ubhrat

- Coral Reef Sites
- Gujarat 1. Gulf of Kutch
- Tamil Nadu 1.
- Gulf of Mannar Andaman & Nicobar 1. Andaman and Nicobar Coral Reef

**22. Ans: (a)**

**Sol:** Non-degradable pollutants mean materials, which cannot be metabolized by the living organisms. Example: chlorinated hydrocarbons.

**23. Ans: (d)**

**Sol:** Harmful Algal Blooms are considered an environmental hazard because these events can make people sick when contaminated shellfish are eaten. Rest of the two are very well known.

**24. Ans: (c)**

**Sol:** In the first and second statements, the common code word is 'kew' and the common word is 'she'. So, 'kew' stands for 'she'.

In the first and third statements, the common code word is 'deko' and the common word is 'apples'. So, 'deko' stands for 'apples'.

**25. Ans: (b)**

**Sol:** Let, Cost Price of X = 100.

So, Selling Price of X = CP of Y = 120% (100) = 120.

Selling Price of Y = Cost Price of Z = 80% (120) = 96.

Given, CP of Z = 960. (Which is obtained after 10 multiple of our assumption)

Hence, SP of X =  $120 \times 10 = 1200$ .

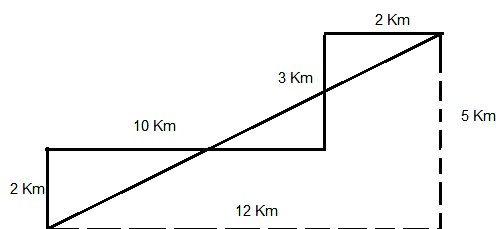
**26. Ans: (a)**

**Sol:** HCF of (1354-10), (1866-10) and (2762-10) is 64.



**27. Ans: (a)**

**Sol:**



10 + 2 = 12 kms north.

3 + 2 = 5 kms east.

Distance from the starting point and ending point.

Thus,  $\sqrt{12^2 + 5^2} = 13$ . This is the shortest distance between the starting point and ending point.

**28. Ans: (c)**

**Sol:** The characteristic equation is

$$(\lambda - 3)(\lambda - 4) = 0$$

$$\Rightarrow \lambda^2 - 7\lambda + 12 = 0$$

By Cayley-Hamilton theorem, we have  $M^2 - 7M + 12 = 0$

Multiplying both sides by  $M^{-1}$ , we get

$$M - 7I + 12M^{-1} = 0$$

$$\therefore M^{-1} = \frac{7I - M}{12}$$

**29. Ans: (a)**

**Sol:** Let  $\lambda_1, \lambda_2$  be two eigen values of A.

$$\lambda_1 + \lambda_2 = 1 \quad (\because \text{tr}(A) = 1)$$

$$\lambda_1 \lambda_2 = -6 \quad (\because \det(A) = -6)$$

On solving we get two eigen values as 3, -2.

**30. Ans: (d)**

$$\text{Sol: } x_{n+1} = \frac{1}{2} \left( x_n + \frac{a}{x_n} \right)$$

Convergent point means  $x_{n+1} = x_n$

$$\Rightarrow x_n = \frac{1}{2x_n} [x_n^2 + a]$$

$$\Rightarrow 2x_n^2 - x_n^2 = a$$

$$\Rightarrow x_n^2 = a$$

$$\Rightarrow x_n = \sqrt{a}$$

**31. Ans: (a)**

$$\begin{aligned} \text{Sol: } E(4x - 3y) &= 4E(x) - 3E(y) \\ &= 4(2) - 3(1) = 8 - 3 = 5 \end{aligned}$$

**32. Ans: (a)**

$$\text{Sol: } p = \frac{\partial f}{\partial x} = y + 1 = 0 \Rightarrow y = -1$$

$$q = \frac{\partial f}{\partial y} = x - 1 = 0 \Rightarrow x = 1$$

$$r = \frac{\partial^2 f}{\partial x^2} = 0, \quad S = \frac{\partial^2 f}{\partial x \partial y} = 1, \quad t = \frac{\partial^2 f}{\partial y^2} = 0$$

$$\text{At } (1, -1), \quad rt - S^2 = -1 < 0$$

$\Rightarrow (1, -1)$  is the saddle point

**33. Ans: (c)**

**Sol:** Given  $A^T = -A$

$$\Rightarrow |A^T| = |-A|$$

$$\Rightarrow |A| = (-1)^n |A|$$

If  $n$  is an odd number

$$\Rightarrow |A| = (-1) |A| \Rightarrow |A| = 0$$

**34. Ans: (b)**

**Sol:** If earned value is more than actual value, it indicates that actual spending is less than budget.

**35. Ans: (b)**

**Sol:** Moving average is suitable for minor works. Regression/smoothing with trend is suitable for projects. Delphi is suitable for major projects.

**36. Ans: (d)**

**Sol:** Hierarchical description of risks is called Risk Breakdown structure

**37. Ans: (b)**

**38. Ans: (b)**



# HEARTY CONGRATULATIONS TO OUR **ESE - 2019** TOP RANKERS



**KARTIKEYA SINGH** EE



**RAJAT SONI** E&T



**HARSHAL BHOSALE** ME



**ABUZAR GAFFARI** CE



**SHAMBHAVI** EE



**ANKUSH MANGLA** E&T



**SAHIL GOYAL** ME



**ABHISHEK ANAND** EE



**ROHIT KUMAR** E&T



**KUMAR CHANDAN** ME



**AMARJEET** CE



**ANKIT TAYAL** EE



**AMIR KHAN** E&T



**SAURAV** ME



**AMAN GULIA** CE



**KUMAR MAYANK** EE



**AYUSH CHANDRA** CE



**RITESH LALWANI** EE



**PUSHPAK** ME



**KABIL BHARGAVA** CE



**KARTIKEY SINGH** EE



**RAHUL JAIN** E&T



**MANISH RAJPUT** ME



**KULDEEP KUMAR** E&T



**HEMANT KUMAR** ME



**YOGESH KUMAR** CE



**DEEPIKA ROY** EE



**SHUBHAM KARNANI** E&T



**D SABAPARA** ME



**ANKIT KUMAR** CE



**ANKITA SHARMA** EE



**GAURAV SRIVASTAVA** E&T



**SUMIT BHAMBO** ME

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(EE: **9**, E&T: **8**, ME: **9**, CE: **7**) and many more...



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39. Ans: (c)

40. Ans: (b)

**Sol:** 7 October was observed as World Cotton Day, an initiative of the so-called Cotton Four (Benin, Burkina Faso, Chad and Mali), supported by the WTO and a few United Nations (UN) organizations. Textiles Minister said that India will be announcing the launch of the second phase of the Cotton Technical Assistance Programme (TAP) for Africa. India implemented a Technical Assistance Programme (TAP) for cotton in 6 African countries, namely – Benin, Burkina Faso, Chad, Malawi, Nigeria and Uganda from 2012 to 2018.

41. Ans: (a)

42. Ans: (d)

**Sol:** All employers must understand and comply with child labor laws for young workers, including ensuring that they work only certain hours as required by law. In addition to following OSHA standards for a safer workplace, employers must provide safety training on workplace hazards in a language that the workers understand (including the minority population).

43. Ans: (b)

**Sol:** A. Adj  $A = |A| I_n$   
 $= 5 I_4$

44. Ans: (b)

**Sol:** In RCC, steel bars act as a reinforcement phase and sand gravels act as a matrix phase.

45. Ans: (c)

**Sol:** The magnetic field lines do not intersect with each other. So statement 3 is wrong.

46. Ans: (d)

**Sol:** Theoretical density =  $\frac{n \times A_w}{N_A \times V_{uc}}$

For BCC crystal structure

No. of effective atoms in a unit cell =  $n = 2$

Atomic weight =  $A_{Fe}$

Volume of unit cell =  $V_{uc} = a^3$

$4R = \sqrt{3} a$

$a = \frac{4R}{\sqrt{3}}$

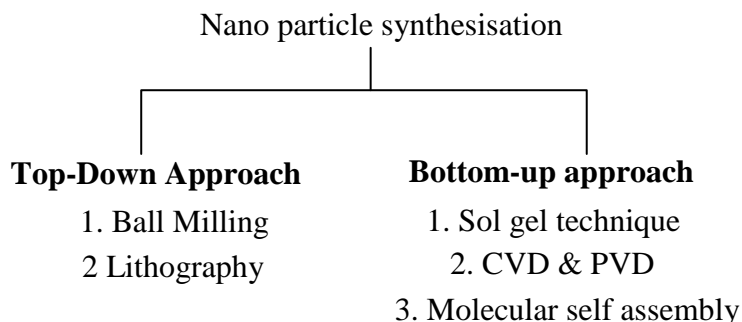
$V_{uc} = a^3 = \left(\frac{4R}{\sqrt{3}}\right)^3 = \frac{64R^3}{\sqrt{3}}$

Theoretical density =  $\frac{2 \times A_{Fe}}{N_A \times \frac{64R^3}{\sqrt{3}}}$   
 $= \frac{\sqrt{3} A_{Fe}}{N_A \times 32R^3}$

47. Ans: (a)

48. Ans: (d)

**Sol:**



49. Ans: (a)

**Sol:** The component can be protected against fracture by

1. Avoiding corners and notches
2. Good surface finish
3. Shotpeening: Introducing residual compressive stresses on the surface

50. Ans: (d)





**Sol:** Descriptive engineering ethics is based on doing good under belief that public would be benefitted. In this approach, no justification is given by the engineers. Analysis depends on empirical research and other indirect methods. Normative ethics involves justification done for the action taken after resolving moral issues thus establishing standards of set moral values. An exhausted body needs water for energy. It is the moral concern of engineer to add glucose for instant energy to the body and aeration for feeling of freshness of self or individual and hence is a special moral right. Business ethics is based on the premise that narrowed focus on profit is not sustainable unless business earns the trust of public.

**51. Ans: (b)**

**52. Ans: (d)**

**53. Ans: (d)**

**Sol:** Organizing awareness programs in public interest is one of the objectives of professional societies and they should not restrict members for fulfilling this obligation. Hence, statement (3) is not correct.

**54. Ans: (c)**

**Sol:** Not every information belonging to the organization is protected legally. Hence the information must be of right type and should qualify to be protected legally. (c) is the correct answer.

Not every information need to be put in material form. Any information made public does not require any legal protection in principle. Organizations claiming legal protection for information cannot decide which data is in public interest. It is the prerogative of the government. Therefore, a, b and d are not the answers.

**55. Ans: (a)**

**Sol:** Skills and knowledge acquired fall under the own property and can be claimed for the purposes for career development.

**56. Ans: (a)**

**Sol:** Engineer can take all the steps but in the order of 1,2,3, and 4. If he takes steps 3 or 4 directly, he will have to face the complaint of disloyalty and disobedience

**57. Ans: (a)**

**Sol:** Miraitowa is the official mascot of Summer Olympics, 2020 to be held in Japan.

**58. Ans: (d)**

**Sol:** Bharat QR code is an interoperable payment acceptance solution that supports visa, master cards.

QR code consists of black squares arranged in a square and on white background which can be read by imaging devices.

Statement (2) is an explanation for UPI (Unified payment Interface)

**59. Ans: (d)**

**60. Ans: (b)**

**Sol:** First statement project is caused as CARD while third statement project is Aakashganga

Hence, (1) and (2) statements are incorrect, statements (3) is correct.

**61. Ans: (b)**

**Sol:** Virtual reality refers to computer technologies that uses virtual reality headset to generate images, sounds and other sensation that replicate a real environment that can be used in training and education hence statement (ii) is correct, and simulate this we need a language caused as Virtual reality modeling language (VRML).

**62. Ans: (c)**



**Sol:** By streamlining operations, changeover time will be reduced automation also reduced changeover time.

**63. Ans: (d)**

**Sol:** Risk priority number (RPN) =  $d \times l \times i$

**64. Ans: (d)**

**Sol:** The references for benchmarking can be (a), (b) and (c).

**65. Ans: (a)**

**Sol:** Phytoplankton

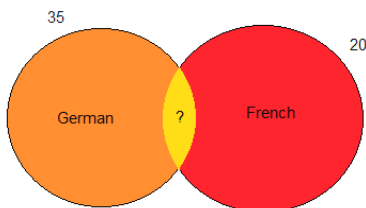
- Phytoplankton obtain energy through the process of photosynthesis and must therefore live in the well-lit surface layer (termed the euphotic zone) of an ocean,
- If they die they stop taking CO<sub>2</sub> from the atmosphere and the ocean will be no more a carbon sink
- They are the primary food for the marine species.

**66. Ans: (a)**

**Sol:** Gujarat has 12,70,875 Hactare area under wetands. Gujarat is followed by West Bengal which as 5,53,090 hactare of wetlands. The statement 1 is correct. Statement 2 is incorrect

**67. Ans: (a)**

**Sol:**



Let G denote the set of tourists speaking German language and F denote the set of tourists speaking French language then as each tourist speaks one of the 2 languages hence Universal set is same as the Union of

the 2 sets. Therefore, we need not draw the rectangle for Universal set.

Let x number of tourists speak both the languages then 35 - x speak German only and 20 - x speak French only.

Total of all the 3 categories be equal to total number of tourists

$$35 - x + x + 20 - x = 40$$

$$\Rightarrow x = 15$$

Hence, 15 speak both the languages.

**68. Ans: (d)**

**Sol:** L.C.M. of 252, 308 and 198 = 2772.

Therefore, X, Y and Z will again meet at the starting point in 2772 sec. i.e. 46 min. 12 sec.

**69. Ans: (c)**

**Sol:** Consider 
$$\begin{bmatrix} 1 & a & 0 \\ 0 & 1 & a \\ a & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

Since the system of infinite no. of sols

$$\Rightarrow \begin{vmatrix} 1 & a & 0 \\ 0 & 1 & a \\ a & 0 & 1 \end{vmatrix} = 0$$

$$\Rightarrow 1 + a^3 = 0 \Rightarrow a = -1$$

**70. Ans: (a)**

**Sol:** In bisection method, we need to evaluate the sign of the function at mid points. If the mid point is a complex number then we can not determine sign of f(x).

**71. Ans: (d)**

**72. Ans: (a)**

**Sol:** 
$$\int_{-1}^1 \frac{dx}{x^2} = 2 \int_0^1 \frac{dx}{x^2} \left( \because \frac{1}{x^2} \text{ is even function} \right)$$
  

$$= 2 \lim_{x \rightarrow 0^+} \int_0^1 \frac{dx}{x^2} \left( \text{since } \frac{1}{x^2} \text{ is not defined} \right)$$

$$= 2 \left( \frac{-1}{x} \right)_0^1 = 2 \{ (-1) - (-\infty) \}$$

$$= \infty (\text{Divergent})$$

73. Ans: (c)

**Sol:** In case of research projects like brahmos, technology collaboration with other countries is considered.

74. Ans: (a)

**Sol:** Gantt chart is a scheduling tool which can also be used for monitoring/contract as tool used to track the progress.

75. Ans: (b)

76. Ans: (d)

77. Ans: (d)

78. Ans: (b)

**Sol:**

- It is related prohibiting the cultivation of G.M-Mustard
- Recently Generic Engineering Appraisal Committee (GEAC) has given approval for G.M.Mustard. NGO & other organisations have launched this Satyagraha against the Govt. decision.

79. Ans: (b)

**Sol:** According to OSHA, all areas in the workplace must be kept clean and orderly. Furthermore, "The floor of every workroom shall be maintained in a clean and, so far as possible, a dry condition. Where wet processes are used, drainage shall be maintained and false floors, platforms, mats, or other dry standing places should be provided where practicable."

80. Ans: (a)

81. Ans: (d)

82. Ans: (d)

83. Ans: (b)

**Sol:** Hazards may be classified into 3- types.

1. *Within the responsibility of engineers* like failure of dams, automotive accidents.
2. *Which cause constraints to design* like Earthquakes, Cyclones, Floods etc.
3. *Socio political disruption* like war, terrorism etc.

84. Ans: (a)

**Sol:**

CLASS	FUEL TYPE
CLASS-A	SOLID FUEL: WOOD, COAL, CHARCOAL
CLASS-B	LIQUID FUEL: PETROL, KEROSENE ETC..
CLASS-C	GASEOUS FUEL: LPG, CNG ETC.
CLASS-D	LIQUID METALS: SODIUM, POTASSIUM ETC
CLASS-E	ELECTRICAL EQUIPMENT
CLASS-F	COOKING OILS

85. Ans: (c)

86. Ans: (a)

87. Ans: (d)

88. Ans: (c)

**Sol:** Hazards can be any of 3 types:

1. Within the control of engineers
2. Cause constraint to design
3. Socio political disruption

89. Ans: (c)

**Sol:** A noise barrier is an exterior structure designed to protect inhabitants of sensitive land use areas from noise pollution. Noise barriers are most effective methods of mitigating road way, rail way and industrial noise sources-other than cessation of the source activity at use of source controls.





**90. Ans: (a)**

**Sol:** Ocean Thermal Energy Conversion (OTEC) plants have very low efficiencies. OTEC works best when the temperature difference between the warmer, top layer of the ocean and the colder deep ocean water is about  $36^{\circ}\text{F}$  ( $20^{\circ}\text{C}$ ). These conditions exist in tropical coastal areas, roughly between tropic of Capricorn and tropic of Cancer. To bring the cold water to the surface, ocean thermal energy conversion plants require an expensive large-diameter intake pipe, which is submerged a mile or more into the ocean's depth.

**91. Ans: (a)**

**92. Ans: (a)**

**93. Ans: (a)**

**94. Ans: (b)**

**Sol:** Using cost of capitalisation, cost of an asset is distributed over some years instead of showing in the year it is bought.

**95. Ans: (a)**

**Sol:** If  $L_1$  contractor doesn't agree to all terms & conditions, project will not be awarded to  $L_1$ .

**96. Ans: (a)**

**Sol:** By seeing the weightage we can easily understand which cause to focus on elimination so that quality can be improved drastically.

**97. Ans: (d)**

**Sol:** QFD always involves cross functional team because engineer is technically not equipped to find customers' voice.

**98. Ans: (a)**

**Sol:** The Digital India programme is a flagship programme of the Government of India with a vision to transform India into a digitally empowered society and knowledge economy. "Faceless, Paperless, Cashless" is one of the professed role of Digital India. Promotion of digital payments has been accorded highest priority by the Government of India to bring each and every segment of our country under the formal fold of digital payment services. The Vision is to provide facility of seamless digital payment to all citizens of India in a convenient, easy, affordable, quick and secured manner.

**99. Ans: (b)**

**Sol:** The iron carbon alloy is an interstitial solid solution because the size of the carbon atom is smaller than iron and carbon atoms easily place at the interstitial position of Fe.

**100. Ans: (a)**

**Sol:** The 2019 Turkish offensive into north-eastern Syria, code-named by Turkey as Operation Peace Spring, was a cross-border military operation conducted by the Turkish Armed Forces and the Syrian National Army against the Syrian Democratic Forces and later the Syrian Arab Army in northeastern Syria.

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