



OFFLINE
TEST SERIES

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India's Best Institute for IES, GATE & PSUs

ESE-2017 : Prelims Exam

UPSC Engineering Services Examination

GENERAL STUDIES & ENGG . APTITUDE

Answer Key & Solutions

Test : 21

Mock Test • Non-Technical (Paper-I)

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

DETAILED EXPLANATIONS

1. (a)

- Swadesh Darshan scheme was launched by the Union Ministry of Tourism with an aim to develop theme based tourist circuits in the country.
- Under the scheme, 13 thematic circuits have been identified. These are Ramayana circuit, Krishna circuit, Buddhist circuit, North-East India circuit, Himalayan circuit, Coastal circuit, Desert circuit, Tribal circuit, Eco circuit, Wildlife circuit, Rural circuit, Spiritual circuit and Heritage circuit.
- Puri (Odisha) is a destination comes under Krishna circuit.

3. (c)

The 6th edition of Heart of Asia – Istanbul Process, an annual regional gathering of Asian and other countries on stability of Afghanistan was concluded on 4 December, 2016 in Amritsar, Punjab.

5. (b)

The Republic of Nauru, a South Pacific Island nation has recently become the 189th member of the International Monetary Fund (IMF) and the World Bank.

6. (a)

- Ashgabat Agreement provides for a transit corridor across Central Asia and the Middle East through Kazakhstan, Uzbekistan, Turkmenistan and Iran before reaching the Persian Gulf and into Oman. It was signed in 2011.
- The Union Cabinet has recently gives its approval for India to accede to the Agreement.

8. (c)

Monetary Policy is the macroeconomic policy laid down by the Reserve Bank of India.

11. (b)

Sum of first 5 numbers = $54 \times 5 = 270$

Sum of last 3 numbers = $52 \times 3 = 156$

Let the 6th number = x

$$\frac{270 + x + 156}{9} = 50$$

$$\begin{aligned} x &= 450 - 270 - 156 \\ &= 24 \end{aligned}$$

12. (a)

$$x = \frac{y+z}{x}, y = \frac{x+z}{y}, z = \frac{x+y}{z}$$

$$\begin{aligned} \frac{1}{1+x} + \frac{1}{1+y} + \frac{1}{1+z} &= \frac{1}{1+\frac{y+z}{x}} + \frac{1}{1+\frac{x+z}{y}} + \frac{1}{1+\frac{x+y}{z}} \\ &= \frac{x}{x+y+z} + \frac{y}{x+y+z} + \frac{z}{x+y+z} = 1 \end{aligned}$$

13. (c)

 $A : B : C$ $x : 8$ $12 : z$ $6x : 48$ $48 : 4z$ $6x : 48 : 4z$

$$\frac{6x}{4z} = \frac{1}{2}$$

$$x : z = \frac{1}{2} \times \frac{4}{6} = 1 : 3$$

14. (d)

Let his usual speed is v_a and time taken is t .

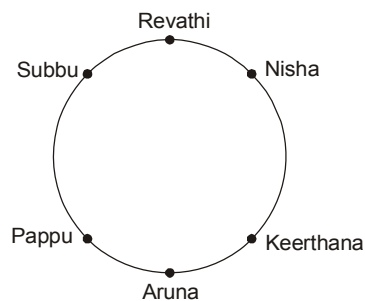
$$v_a \times t = \frac{3}{4}v_a(t+20)$$

$$t = \frac{3}{4}(t+20)$$

$$t = \frac{3}{4}t + 15$$

$$t = 60 \text{ mins}$$

15. (b)



16. (a)

Let the amount is x .

$$2544 = x \left[1 + \frac{12}{100} \right]^2 - x$$

$$2544 = x \left[\left(\frac{112}{100} \right)^2 - 1 \right]$$

$$2544 = x \left[\frac{112}{100} + 1 \right] \left[\frac{112}{100} - 1 \right]$$

$$x = \frac{2544 \times 100 \times 100}{212 \times 12}$$

$$\text{Simple Interest} = \frac{x \times 12 \times 2}{100}$$

$$= \frac{2544 \times 100 \times 100 \times 12 \times 2}{212 \times 12 \times 100} = ₹ 2400$$

17. (b)

Let x, y, z are the shares of A, B, C respectively

$$4x = 6y = 3z = k$$

$$x = \frac{k}{4}, y = \frac{k}{6}, z = \frac{k}{3}$$

$$x + y + z = 1800$$

$$\frac{k}{4} + \frac{k}{6} + \frac{k}{3} = 1800$$

$$\Rightarrow k = 2400$$

$$\text{A's share } x = \frac{k}{4} = \frac{2400}{4} = ₹ 600$$

18. (a)

$$\text{Both pipes can fill in 1 minute} = \frac{1}{12} + \frac{1}{15} = \frac{9}{60} = \frac{3}{20}$$

$$\text{Both pipes can fill in 3 minutes} = \frac{3 \times 3}{20} = \frac{9}{20}$$

$$\text{remaining part} = 1 - \frac{9}{20} = \frac{11}{20}$$

$$\text{Q fill in 1 minutes} = \frac{1}{15}$$

$$\text{Q fill } \frac{11}{20} \text{ in} = 15 \times \frac{11}{20} = \frac{33}{4} = 8\frac{1}{4} \text{ minutes}$$

19. (a)

Let number of correct question are x .

$$3x - 2(30 - x) = 40$$

$$3x - 60 + 2x = 40$$

$$x = 25$$

20. (d)

$$\begin{array}{cccccc} 17 & 43 & 81 & 131 & 193 & \\ \hline & 17 & 38 & 50 & 62 & \\ \hline & +12 & +12 & +12 & & \end{array}$$

21. (c)

$$(A - \lambda I) = 0$$

$$\begin{bmatrix} 2 & 1 \\ -2 & -1 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} = 0$$

$$2X_1 + X_2 = 0$$

$$-2X_1 - X_2 = 0$$

Let $X_1 = k$, $X_2 = -2k$

$$\Rightarrow \text{eigen vector} = \begin{bmatrix} k \\ -2k \end{bmatrix} \begin{bmatrix} -1 \\ 2 \end{bmatrix}$$

22. (c)

Characteristic equation of matrix A is

$$\lambda^2 - 5\lambda + 6 = 0$$

This satisfy matrix A

$$\Rightarrow A^2 = 5A - 6I$$

23. (a)

$$f(x) = e^{-x}(x^2 - x + 1)$$

$$f'(x) = e^{-x}(x^2 - x + 1) + e^{-x}(2x - 1) = -f(x) + e^{-x}(2x - 1)$$

For minima/maxima $f'(x) = 0$

$$-e^{-x}(x^2 - x + 1) + e^{-x}(2x - 1) = 0$$

$$(-x^2 + x - 1 + 2x - 1)e^{-x} = 0$$

$$x^2 - 3x + 2 = 0$$

$$x = 2, 1$$

$$f''(x) = -f'(x) - e^{-x}(2x - 1) + e^{-x}(2)$$

$$f''(x) = -f'(x) + e^{-x}[-2x + 1 + 2]$$

$$f''(1) = 0 + e^{-1}[-2 + 3] > 0 \Rightarrow \text{minima}$$

$$f''(2) = 0 + e^{-2}[-4 + 3] < 0 \Rightarrow \text{maxima}$$

24. (b)

$$I = \int_0^{\infty} x^{3-1} e^{-x} dx = \frac{1}{3} = 2! = 2$$

25. (a)

$$\text{Div } V = \nabla \cdot V$$

$$\text{curl of Div } V = 0 \text{ always}$$

26. (b)

$$D^2 + 9 = 0$$

[characteristic equation]

$$D = \pm 3i$$

$$x(t) = c_1 \cos 3t + c_2 \sin 3t$$

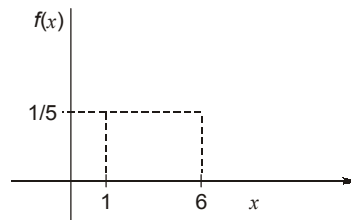
27. (c)

$$z = \frac{1}{2} + \frac{\sqrt{3}}{2}i = e^{i\pi/3}$$

$$z^i = (e^{i\pi/3})^i = e^{e^{i\pi/3} \times i} = e^{-\pi/3}$$

28. (d)

$$\text{Variance} = \int_{-\infty}^{\infty} x^2 f(x) dx$$



$$= \int_1^6 x^2 \frac{1}{5} dx = \frac{1}{5} \times \frac{x^3}{3} \Big|_1^6 = \frac{43}{3}$$

29. (c)

$$f(x) = e^x - x^2$$

$$f'(x) = e^x - 2x$$

$$x_1 = x_0 - \frac{f(x)}{f'(x)}$$

$$= 0 - \frac{e^0 - 0}{1 - 0} = -1$$

30. (a)

$$\text{Probability that person is included} = \frac{{}^{11}C_3}{{}^{12}C_4} = \frac{1}{3}$$

$$\text{Probability that person is never included} = 1 - \frac{1}{3} = \frac{2}{3}$$

31. (c)

Safety management strengthens corporate culture.

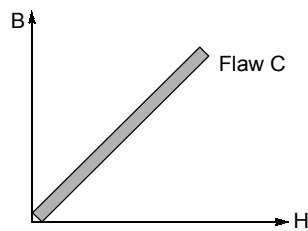
41. (d)

Type-B OC curve gives probability of acceptance for an individual lot coming from continuous. Process or infinities size lot.

44. (d)

ISO 9001 is for "what is requirement".

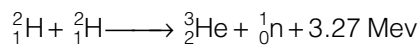
47. (b)



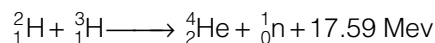
Flaw C can be broken in horizontal and vertical components and then horizontal component is detectable by MPT.

50. (c)

In the case of nuclear fusion reaction, hydrogen atoms combined together at very high temperature which result helium as end product.



(Deuterium – Deuterium Fusion)



(Deuterium – Tritium Fusion)

Nuclear fusion releases electromagnetic radiations not radioactive rays, as Helium is a quite stable element.

52. (d)

The ecological footprint of a person is calculated by considering all the biological materials consumed and the carbon dioxide emission generated by that person in a given year.

53. (d)

National Green Tribunal (NGT) was established under the National Green Tribunal Act, 2010 to provide a specialized forum for effective and speedy disposal of cases pertaining to environmental protection, conservation of the forests and for seeking compensation for damages caused to people or property due to violation of environmental laws.

54. (d)

The major causes of coral bleaching are global warming, ocean acidification, pollution from land, El-nino, overfishing, etc.

57. (c)

- The validity period of environmental clearance means the period from which a prior environmental clearance is granted by the regulatory authority to the completion of that project.
- The prior environmental clearance granted for a project or activity shall be valid for a period of 10 years in the case of river valley projects, 30 years for mining projects and 7 years in the case of all other projects and activities. However, in the case of area development projects and township, the validity period shall be limited only to such activities as may be the responsibility of the applicant as a developer. This period of validity may be extended by the concerned regulatory authority for a maximum period of 7 years if an application is made to the regulatory authority by the applicant within the validity period.

59. (a)

In project financing, releasing of fund is depends on progress of project.

62. (a)

Open tender because it ensures more participation and competitive rates.

64. (d)

Value engineering considers possible cost trade-offs as a design evolves. The technique entails identifying the functions that are needed and analyzing the cost effectiveness of the alternatives available for providing them. It helps optimize project life cycle costs, save time, increase profits, improve quality, increase market share, solve problems, and contribute toward more effective resource use.

65. (d)

Collocation is the placement of team members in the same physical location to enhance their ability to perform as a team, primarily through increased communication as well as improved working relationships and productivity.

66. (a)

A contract can end in successful performance, mutual agreement, or breach of contract. Contract closeout by mutual agreement or breach of contract is called contract termination.

67. (a)

Curie temperature is boundary between ferroelectric and para-electric materials.

68. (b)

According to Curie law,

$$\chi_m = \frac{C}{T}$$

where

$\chi_m \rightarrow$ Magnetic susceptibility

$T \rightarrow$ Absolute temperature

$C \rightarrow$ Curie constant

Therefore,

$$\chi_m \propto \frac{1}{T}$$

72. (b)

Here

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

and

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

So

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

74. (a)

$$\alpha_0 = \frac{P_p^2}{3kT}$$

P_p - magnitude of permanent dipole moment

k - Boltzmann's constant

75. (c)

Wavelength,

$$\lambda(\mu\text{m}) = \frac{1.24}{E_g(\text{eV})}$$

$$\lambda = \frac{1.24}{1.43} \mu\text{m} = 0.867133 \mu\text{m}$$
$$= 8671.33 \text{ \AA}$$

81. (d)

Akash-1 has resistive touch-screen while Akash-2 has capacitive touch screen.

86. (a)

- The four main branches of ethics include applied ethics, normative ethics, meta-ethics and descriptive ethics.
- Applied ethics deals with the philosophical examination, from a moral standpoint of particular issues in private and public life which are matters of moral judgement.
- Normative ethics deals with norms or set of considerations how one should act. It is a study of ethical action and sets out the rightness or wrongness of the action. It is also called as prescriptive ethics.
- Meta ethics deals with the origin of the ethical concept themselves. It does not consider whether an action is good or bad, right or wrong; rather it questions - what goodness or normality itself is?
- Descriptive ethics deals with what people actually believe to be right or wrong, and accordingly holds up the human actions acceptable or not acceptable or punishable under a custom or law.

88. (c)

Virtue ethics is an approach that deemphasizes rules, consequences and particular acts and places the focus on the kind of person who is acting.

94. (a)

Integrity is:

- Consistently behaving in an open, fair, and transparent manner
- Working to uphold the public service values
- Honouring one's commitments
- Standing firm when dealing with unreasonable requests

95. (a)

- The purpose of codes is to prevent certain behaviours and not to punish errant behaviour.
- Codes are meant for guiding professionals who want to do good things and avoid evil actions.
- Codes by their nature is focused on guiding individuals in dealing with value conflicts.

98. (a)

- Higher the temperature of water, lower is dissolved oxygen in water.
- The actual amount of dissolved oxygen depends on temperature, pressure and salinity.

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