



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 : 19

Mock Test • Non-Technical (Paper-I)

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

DETAILED EXPLANATIONS

1. (a)

The Union Ministry of Urban Development is nodal agency for implementation of Smart Cities Mission in collaboration with the state governments of the respective cities.

2. (b)

- Goods and Services Tax (GST) will only subsume present indirect taxes not the direct taxes.
- The Octroi and entry taxes will be subsumed at the state level.

4. (c)

Pradhan Mantri Ujjwala Yojana (PMUY) is being implemented by Union Ministry of Petroleum and Natural Gas. It is for the first time this ministry is implementing a welfare scheme.

6. (a)

The BIMSTEC countries comprise of Bangladesh, India, Myanmar, Sri Lanka, Thailand, Bhutan and Nepal.

7. (c)

- Nuclear Suppliers Group (NSG) is related to regulation of export of nuclear related technologies, equipments and materials.
- Wassenaar Arrangement is related to conventional arms and dual-use goods & technologies.
- Australia Group is related to restrictions of export of chemical and biological weapons.
- Nuclear Non-proliferation Treaty (NPT) was established to prevent the spread of nuclear weapons and related technologies.

11. (c)

Let the parts are respectively x , y , z .

$$\frac{1}{2}x = \frac{1}{3}y = \frac{1}{4}z = k$$

$$x = 2k, y = 3k, z = 4k$$

$$2x + 3k + 4k = 81$$

$$k = 9$$

$$x = 18, y = 27,$$

$$z = 36$$

12. (d)

The time taken by him

$$= \frac{10}{3+2} + \frac{10}{3-2} = 2 + 10 = 12 \text{ hours}$$

13. (d)

Let the numbers are x , $2x$, $3x$

$$x + 5 : 2x + 5 : 3x + 5$$

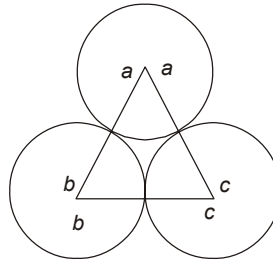
$$\frac{x+5}{2x+5} = \frac{2}{3}$$

From here $x = 5$

\Rightarrow numbers are 5, 10, 15

14. (a)

By Heron's Formula

Area of triangle is = $\sqrt{s(s-a)(s-b)(s-c)}$

$$s = \frac{2a+2b+2c}{2} = a+b+c$$

$$\begin{aligned} \text{Area of triangle} &= \sqrt{(a+b+c)(a+b+c-a)(a+b+c-b)(a+b+c-c)} \\ &= \sqrt{(a+b+c)abc} \end{aligned}$$

15. (b)

$$y = \sqrt{x} - \frac{1}{\sqrt{x}}$$

squaring both sides, we get

$$\begin{aligned} y^2 &= x + \frac{1}{x} - 2 \\ &= 3 + 2\sqrt{2} + \frac{1}{3+2\sqrt{2}} - 2 \\ &= 3 + 2\sqrt{2} + \frac{1}{3+2\sqrt{2}} \times \frac{3-2\sqrt{2}}{3-2\sqrt{2}} - 2 \\ &= 3 + 2\sqrt{2} + 3 - 2\sqrt{2} - 2 = 4 \\ y &= \pm 2 \end{aligned}$$

16. (b)

$$\text{Average speed} = \frac{\text{Total Distance}}{\text{Total time}} = \frac{4 \times 6}{\frac{6}{25} + \frac{6}{50} + \frac{6}{75} + \frac{6}{150}} = 50 \text{ Km/h}$$

17. (b)

Let the cost price is ₹ x

$$\begin{aligned} \text{Selling price} &= \frac{80}{100} \times x \\ &= ₹ 0.8x \end{aligned}$$

$$\text{New selling price} = ₹(0.8x + 12)$$

$$\text{gain} = ₹(0.8x + 12 - x)$$

$$\text{gain \%} = \frac{12 - 0.2x}{x} \times 100 = 10$$

$$120 - 2x = x$$

$$x = 40$$

$$\Rightarrow \text{cost price} = ₹ 40$$

18. (c)

$$y = (0.11)^3 + (0.22)^3 + \dots + (0.99)^3$$

$$= (0.11)^3 [1^3 + 2^3 + \dots + 9^3] = (0.11)^3 \left[\frac{9 \times (9+1)}{2} \right]^2$$

$$= (0.11)^3 (45)^2$$

$$= 0.001331 \times 2025 = 2.695$$

19. (b)

$$y = 16 + 24 \div 8 - 6 \div 2 \times 3$$

$$= 16 + 3 - 3 \times 3 = 16 + 3 - 9 = 10$$

20. (a)

$$\text{Interior angle} = \left(\frac{n-2}{n} \right) \times 180^\circ$$

$$\text{Exterior angle} = \frac{360^\circ}{n}$$

$$\left(\frac{n-2}{n} \right) \times 180^\circ = \frac{360^\circ}{n} \times 2$$

$$n = 6$$

21. (c)

Diagonal elements are $1^2, 2^2, 3^2, \dots, n^2$

$$\text{trace} = \sum_{r=1}^n r^2 = \frac{n(n+1)(2n+1)}{6}$$

22. (c)

System has dependent solutions so system is consistent.

rank of $A = \text{rank of } [A : B]$

23. (d)

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

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

$$f(x_0) > f'(x_0)$$

$$\{x_0 > x_1 \Rightarrow x_0 - x_1 > 0\}$$

24. (b)

$$\int_{-\infty}^{\infty} f(x) dx = 1$$

Since mean = 0

$$\Rightarrow \int_{-\infty}^0 f(x)dx = \int_0^{\infty} f(x)dx$$

So
$$F(x) = \int_{-\infty}^0 f(x)dx = \frac{1}{2} = 0.5$$

25. (c)

$$\begin{aligned} P(E) &= P(H) + P(T) P(T) P(H) + P(T) P(T) P(T) P(T) P(H) \dots \\ &= \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \dots = \frac{1}{2} + \frac{1}{4} \times \frac{1}{2} + \left(\frac{1}{4}\right)^2 \times \frac{1}{2} \dots \end{aligned}$$

Infinite GP
$$P(E) = \frac{\frac{1}{2}}{1 - \frac{1}{4}} = \frac{2}{3}$$

26. (a)

Let the iteration converges to α .

$$\begin{aligned} x_{n+1} &= x_n = \alpha \\ \alpha &= \frac{1}{2} \left(\alpha + \frac{3}{\alpha} \right) \end{aligned}$$

$$2\alpha = \alpha + \frac{3}{\alpha}$$

$$\alpha = \frac{3}{\alpha}$$

$$\alpha = \sqrt{3} = 1.732$$

27. (b)

$$x(t) = t^3 - 9t^2 + 24t + 5$$

$$\frac{dx(t)}{dt} = v(t) = 3t^2 - 18t + 24$$

For minima/maxima
$$\frac{dv}{dt} = 6t - 18 = 0$$

$$t = 3 \text{ sec}$$

$$\frac{d^2v}{dt^2} = 6 > 0 \Rightarrow \text{minima}$$

28. (d)

$$\lim_{x \rightarrow 0} \frac{\int_0^x f(t)dt}{x} = \lim_{x \rightarrow 0} \frac{f(x) \times 1}{1} = f(0)$$

29. (d)

$$I = \int \frac{dx}{e^x - 1} = \int \frac{e^{-x} dx}{1 - e^{-x}}$$

Let

$$1 - e^{-x} = t$$

$$-e^{-x}(-1)dx = e^{-x}dx = dt$$

$$\int \frac{dt}{t} = \ln t + c$$

Putting value of t .

$$I = \ln(1 - e^{-x}) + c$$

30. (b)

$$|x + iy - 2| = 4$$

$$\sqrt{(x-2)^2 + y^2} = 4$$

$$(x-2)^2 + y^2 = 4^2$$

centre (2, 0) and radius = 4

31. (c)

$$\text{Area of sheet A1} = 1 \text{ m}^2$$

$$\text{Area of sheet A4} = 0.125 \text{ m}^2$$

$$\frac{\text{Area of sheet A1}}{\text{Area of sheet A4}} = \frac{1}{0.125} = 8$$

40. (b)

Length of arrowhead is three times of its width.

50. (a)

Use of prods creates magnetic field in test objects through direct induction only.

52. (c)

The wind resources are more intermittent and strongly influenced by terrain or geographical factors.

55. (b)

The ecological pyramids based on numbers of individual species are upright in marine food chain.

59. (c)

Oil zapping is one of the bioremediation techniques involving the use of oilzappers. These are the mixture of five micro-bacterial strains which are capable to degrade crude oil and oil sludge very fast.

60. (d)

The Member-Secretary of the concerned State Pollution Control Board (SPCB) shall finalize the date, time and exact venue for the conduct of public hearing within 7 days of the date of receipt of the draft EIA report from the project proponent and advertise the same in one major national newspaper and one regional vernacular newspaper. A minimum notice period 30 days shall be provided to the public for furnishing their responses.

67. (b)

It is must for a PM to have leadership quality so as to take the project to a conclusive final point.

71. (c)

$$\text{Loss factor} = \frac{\epsilon''}{\epsilon'}$$

72. (c)

In an insulating material connected to an a.c. signal, the dielectric constant and atomic polarisation decrease with frequency.

78. (c)

All ferroelectric materials are piezo-electric materials but converse is not true.

81. (a)

Applications softwares are not available on cloud. But these helps to access costly softwares available on web-based services being provided by clouds service providers.

90. (d)

- Virtue ethics theory regards an action right if it supports good character traits (virtues) and wrong if it manifests bad character traits (vices).
- A person's character is the totality of his/her character traits. Our character traits can be good, bad or somewhere in between. They can be admirable or not.

91. (d)

- Honesty has two aspects, namely truthfulness and trustworthiness.
- Discretion is a quality of behaving such a way to avoid causing offence or revealing confidential information.

92. (b)

- Affective empathy, also called emotional empathy or primitive empathy, is the subjective state of feeling to respond appropriately to other's emotions.
- Cognitive empathy is the largely conscious drive to recognize accurately and understand other's emotional state.

93. (d)

- **Disobedience by contrary actions:** Engaging in actions contrary to the interests of the company/management.
- **Disobedience by non-participation:** Refusing to carry out an assignment because of moral or professional objections.
- **Disobedience by protest:** Actively and openly protesting a policy or action, E.g. – Whistleblowing.

98. (d)

A technical segment of a project must not be signed by project coordinator, if it is not signed and sealed by a qualified engineer.

