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ESE- 2020 (Prelims) - Offline Test Series Test-21

GENERAL STUDIES AND ENGINEERING APTITUDE

FULL LENGTH MOCK TEST-1 (PAPER-I)
SOLUTIONS

01. Ans: (c)

Sol: Assessment is analysis stage. Ethical issues in this stage arise about the judgments to be made about technological and economic feasibilities. These issues need high levels of creativity, imagination and visualization. Development stage is concerned with the identification of right technology to be used. Production or operation raises issues about proper implementation of procedures adopted. These two issues need right of processes to be identified and understood, and high levels of skills. Last, Maintenance stage deals with issues related to training, adapting, preventive and corrective maintenance procedures to be implemented. This stage requires understanding and practicing of the laid down procedures.

02. Ans: **(b)**

Sol: Organizational goals and good engineering practices do not match with each other in practice. This raises conflict occasionally. Professional standards advocate for more concern for public than prescribed by law, a line taken by organization. This raises dilemma again. (1) and (3) are correct. Not obeying order is a disobedience problem and an internal matter of the organization that has no direct bearing on ethical commitments. Hence (2) is the weakest factor.

03. Ans: (a)

Sol: Study of engineering ethics is not concerned about loyalty to employer. This aspect is contractual agreement between engineer and employer.

04. Ans: (c)

Sol:

1. Pyramid of Numbers: This deals with the relationship between the numbers of primary producers and consumers of different levels.
2. Pyramid of Biomass: In this approach individuals in each trophic level are weighed instead of being counted.

05. Ans: (b)

Sol: Flights carrying national leaders are considered as "state aircraft" and are not subject to its provisions, the International Civil Aviation Organisation (ICAO) said, in response to India's complaint against Pakistan for its refusal to let the prime minister's plane go through its airspace to Saudi Arabia.

06. Ans: (b)

Sol: What surrounds an organism is Environment.

- Ecology..from the word itself one can understand it is a study.

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- Ecotone is a zone of junction between two or more diverse ecosystems.

For e.g. the mangrove forests represent an ecotone between marine and terrestrial ecosystem. Other examples are grassland, estuary and river bank.

07. Ans: (c)

Sol: Both the statements are true

- It occurs naturally in the upper layers of the atmosphere. This important gas shields the earth from the harmful ultraviolet rays of the sun. However, at-the ground level, it is a pollutant with highly toxic effects.
- Photochemical smog (smog) is a term used to describe air pollution that is a result of the interaction of sunlight with certain chemicals in the atmosphere. One of the primary components of photochemical smog is ozone.

08. Ans: (d)

Sol: Presence of organic and inorganic wastes in water decreases the dissolved Oxygen (DO) content of the water. DO content of water is important for the survival of aquatic organisms. A number of factors like surface turbulence, photosynthetic activity, 02 consumption by organisms and decomposition of organic matter are the factors which determine the amount of DO present in water.

- The higher amounts of waste increases the rates of decomposition and 02 consumption, thereby decreases the DO content of water. The demand for 02 is directly related to increasing input of organic wastes and is empressed as

biological oxygen demand (BOD) of water.

- Water pollution by organic wastes is measured in terms of Biochemical Oxygen Demand , (BOD). BOD is the amount of dissolved oxygen needed by bacteria in decomposing the organic wastes present in water. It is expressed in milligrams of oxygen per litre of water.
- The higher value of BOD indicates low DO content of water. Since BOD is limited to biodegradable materials only. Therefore, it is not a reliable method of measuring pollution load in water.

09. Ans: (c)

Sol: The microorganisms may be indigenous to a contaminated area or they may be isolated from elsewhere and brought to the contaminated site.

Bioremediation is the use of microorganisms (bacteria and fungi) to degrade the environmental contaminants into less toxic forms.

- The microorganisms may be indigenous to a contaminated area or they may be isolated from elsewhere and brought to the contaminated site.

10. Ans: (b) **11. Ans: (a)**

12. Ans: (c)

Sol:

- Improper Maintenance leads to gradual damage of the equipment.
- Not training Employees properly can lead to accidents or damages.
- Hazards can lead potential accidents

13. Ans: (a)

14. Ans: (a)

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.

15. Ans: (d)

16. Ans: (b)

Sol: We have to consider the number of 4's in two digit numbers. _ _

If we fix 4 in the 10^{th} place, unit place be filled with 10 ways.

If we fix 4 in units place, 10^{th} place be filled with 9 ways (0 is not allowed)

So total 19 ways.

Alternatively:

4's in units place 14, 24, 34..., 94 & total 4's in tens place 40, 41, 42.... 49

Thus, 9 + 10 = 19.

17. Ans: (b)

Sol: Printing Cost of book = 20% of C.P.

Royalty on book = 15% of C.P.

Difference = (20% of C.P.) – (15% of C.P)

= 5% of C.P.

Therefore,

$$\text{Percentage difference} = \frac{Difference}{\text{Print}ing} \times 100\%$$

$$\text{Percentage difference} = \frac{5\%\ of\ C.P}{\text{Print}ing\ Cost} \times \%$$

$$= 25\%$$

18. Ans: (a)

Sol: The least number which is exactly divisible by each one of the numbers 15, 27, 35 and 42 is the L.C.M of these numbers.

L.C.M. of 15, 27, 35 and 42 is = 1890

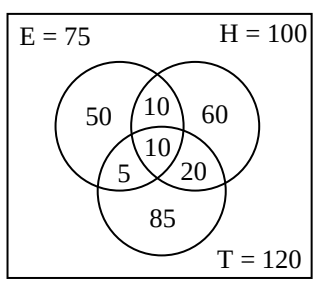
The required number = (1890 + 7) = 1897

19. Ans: (b)

Sol: Among given combinations of
A + B, B + C, C + A.
Two combinations fast completing work is A + B, B + C.
The common candidate is B.
So, B can complete work fast.

20. Ans: (c)

Sol: Let the total strength of class is X.
75 can speak English.
No. of students who can speak English and Telugu = 75/5 = 15
100 can speak Hindi.
No. of students who can speak English and Hindi = 100/5 = 20
120 can speak Telugu
No. of students who can speak Telugu and Hindi = 120/4 = 30
10 can speak all the three languages.



No. of students who can speak at least two languages = 10 + 10 + 5 + 20 = 45

21. Ans: (b)

Sol: 1. $\nabla\phi = \bar{i}\frac{\partial\phi}{\partial x} + \bar{j}\frac{\partial\phi}{\partial y} + \bar{k}\frac{\partial\phi}{\partial z}$

So, it is a vector function

2. $\nabla(\text{const}) = 0$

3. $\frac{\nabla\phi}{|\nabla\phi|}$ is a unit normal vector.

22. Ans: (d)

Sol: Let A = $\begin{bmatrix}1 & 0\\ 0 & 0\end{bmatrix}$ and B = $\begin{bmatrix}0 & 0\\ 0 & 1\end{bmatrix}$ the

AB = BA = 0 But A ≠ I and B ≠ I
∴ Option (d) is false.

23. Ans: (b)

Sol: $A = \begin{bmatrix}2 & -3 & -1\\ -4 & 6 & 2\\ 2 & -9 & -1\end{bmatrix}$

Here, $R_2 = -2R_1$ and $R_3 = 3R_1$
A has only one independent row
∴ $\rho(A) = 1$

24. Ans: (d)

Sol: For sum to exceed 8, the required cases are

For 9	For 10	For 11	For 12
6,3	6,4	6,5	6,6
3,6	4,6	5,6	
5,4	5,5		
4,5			

Favorable cases =10
Total cases = 6 ×6
∴Required probability = $\frac{10}{6^2} = \frac{10}{36}$

25. Ans: (a)

Sol: Standard deviation of uniform distribution

$= \sqrt{\frac{(b-a)^2}{12}} = \frac{1}{\sqrt{12}}$ [here b=1,a=0]

26. Ans: (a)

Sol:

Path	Duration	
1-2-4-5	4+4+3 = **11 days**	**Critical**
1-2-3-4-5	4 + 0 + 4 + 3 = **11 days**	
1-3-4-5	3 + 4 + 3 = 10 days	
1-3-5	3+2 = 5 days	

Activity 'C' has least cost slope on path 1-2-4-5 and Activity 'D' has least cost slope on path 1-2-3-4-5.
Cost for crashing activities C and D by 1 day = 80 + 60 = 140

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27. Ans: (b)

Sol: Miles stone chart can't help manager to track progress. It can only gives some check points (milestones) to review.

28. Ans: (b)

Sol: In mass production, process methodology for all units is almost same.

29. Ans: (a)

Sol: For simple cubic structure:

$N = 1$

$V_{Unit\ cell} = a^3 = (2R)^3 = 8R^3$

$V_{Particle} = \frac{4}{3}\pi R^3$

$$APF = \frac{1 \times \frac{4}{3}\pi R^3}{8R^3} = \frac{\pi}{6}$$

30. Ans: (a)

Sol: $H = 10^4$ A/m

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

$M = \chi H = (3.7 \times 10^{-3}) \times 10^4 = 370$ A/m

$B = \mu_0(M + H) = 4\pi \times 10^{-7}\ (370 + 10^4)$

$= 1.303 \times 10^{-2} = 0.013$ Tesla

31. Ans: (c)

Sol: Glass Fibre Reinforced Gypsum:

It is a composite material used as a building material

Reinforcement phase = Glass

Matrix phase = Gypsum

Application: (1) Construction of buildings

(2) IIT Tirupati buildings

32. Ans: (c)

Sol: Electrical conductivity of a material decreases with

(1) Increasing temperature

(2) Adding impurities

(3) Hard drawn operation

Pure copper material here higher conductivity than hard drawn and alloying copper material.

33. Ans: (b)

Sol: 1. Is an objective of mission called as mahila E-Haat.

2. SHE-box, it is to ensure the effective implementation of sexual harassment of women at workplace (prevention, prohibition and Redressal) Act, 2013.

34. Ans: (a)

Sol: White-fi is a technology that was unused frequency of cable television network to provide data communication.

35. Ans: (a)

Sol: Chandrayaan-2 is the second mission to the moon which was launched on 22 July, 2019 by India's Geosynchronous Satellite Launch Vehicle (GSLV Mk III). It reached lunar orbit on 19 August, 2019. Despite the crash-landing of the Lander, ISRO confirmed that all the instruments are onboard the orbiter and are working well.

36. Ans: (d)

Sol: Cryptocurrency is type of digital currency that uses cryptography for security and anti-counterfeiting measures. The use of public and private keys is done to transfer cryptocurrency between two parties. It is not issued by any central authority rendering.

It immune to government interference or manipulation.

37. Ans: (b)

Sol: Machine translation, it allows for customization by domain or profession improving output by limiting the scope of allowable substitutions.

Eg. Google translate

38. Ans: (b)

Sol: According to deming management is mainly responsible for downfall of a company.

39. Ans: (c)

Sol: CONQUAS (Construction Quality Assessment System) rates a building based on workmanship in the areas of
(A) Architecture
(B) Structure
(C) Mechanical & Electrical

40. Ans: (a)

Sol: By giving long term contracts negotiation can be reduced. Also effort can be put to train vendor on tools of quality so that he/she can be made owner of quality.

41. Ans: (a)

Sol: Pursuing higher education is a professional obligation and may or may not be fulfilled. Promotions, assignment of critical works.

42. Ans: (b)

43. Ans: (c)

Sol: Gilligan's moral development theory is based on ethics of care. Hence, not true.

44. Ans: (d)

45. Ans: (a)

Sol: Mild levels of extra chlorination has a short term risk of excessive smelling of water and possibility of burning sensation in the stomach but has long term benefit of increasing immunity to gastroenteritis related problems.
Eating Pizza is a short benefit of enjoyment but in the long run has a risk of obesity.
Skipping a periodical maintenance routine is called expected probability risk.
Walking bare foot on the sea shore is a voluntary risk.

46. Ans: (d)

Sol: In size, mangroves range from bushy stands of dwarf mangroves found in Gulf of Kuchchh, to taller stands found in the Sunderbans.

47. Ans: (d)

Sol: THE Ministry of Environment, Forest and Climate Change (MoEF&CC) started functioning in 1985. The Ministry plans, promotes, coordinates and oversees environmental, ecological, forestry and wildlife programmes. Its main activities include protection of the environment; conservation of existing forests, wildlife, aquatic bodies and water resources, biodiversity and other resources particularly in eco-sensitive areas, adaptation to and mitigation from climate change etc.,

- It is nodal agency for United Nations Environment Programme (UNEP). International Centre for Integrated Mountain Development (ICIMOD) and Multilateral Environmental Agreements (MEAs). The Ministry also coordinates with multilateral bodies such as United Nations Convention to Combat Desertification (UNCCD), United Nations Framework Convention on Climate Change (UNFCCC), Convention on Biological Diversity (CBD).

48. Ans: (a)

Sol: To conserve, project and manage the coastal and marine environment, the Ministry of Environment is implementing the India Integrated Coastal Zone Management (ICZM) Project with the World Bank assistance. For the implementation of the project the Ministry has established a Society of Integrated Coastal Management (SICOM) as nodal body under the Society Registration Act, in Delhi.

49. Ans: (c)

Sol: Genetic Engineering Appraisal Committee
All GMOs and products thereof are regulated under Rules 1989 of EPA, 1986. Activities undertaken for implementation of Rules 1989 since inception till 2015 include:

- Convene monthly Genetic Engineering Appraisal Committee (GEAC) meeting as per schedule for review of applications pertaining to GM technology. So far 126 meetings of the GEAC have been convened. Status of GEAC approvals is as given here: Bt cotton the first GM crop was approved in 2002.
- As of date, the GEAC has approved environmental release of Bt cotton expressing six events. Approvals for confined field trials of several GM crops for generation of biosafety data both from the private and public sector institutions. These include transgenic maize, rice, tomato, potato, castor, rubber, cotton, brinjal, mustard, groundnut, sorghum, wheat, watermelon, papaya, sugarcane, banana, pigeon pea, chickpea, artemisia.

50. Ans: (a)

Sol: The correct order of sequence is
Specifications stage → Conceptual design → Embodiment design → Detail Design → Manufacture Stage → Product usage

51. Ans: (c)

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

52. Ans: (b) **53. Ans: (b)**

54. Ans: (b)

55. Ans: (d)

Sol: Since, one Statement is negative, the conclusion must be negative.
So, neither conclusion follows.

56. Ans: (c)

Sol: HCF of 4 and 3.2 is 0.8.
No. of tiles required is
(4*3.2)/(0.8*0.8) = 20

57. Ans: (c)

Sol: Let the speed of train be s.
Relative speeds of train with respect to the two men are (s+18) and (s+24).
Since the distance covered in both cases is the length of the train,
(s+18)*22.5 = (s+24)*20
s = 30 kmph

58. Ans: (a)

Sol: No. of rotten coconuts/dozen = 25% of 12
= 3
Cost price of 12 coconuts in which 3 are rotten (9 good coconuts) = Rs. 144

Selling price of 9 coconuts should give a profit of 20%. So, 9 coconuts should be sold at Rs.144*1.2 = Rs.172.8

SP of 12 coconuts = Rs. $172.8 * \frac{12}{9}$

= Rs 230.4

59. Ans: (c)

Sol: In order that the number is divisible by 4, the last two digits of the number have to be 56, 76, 96, 68 or 88. The first two digits of these numbers can be filled in 5 * 5 = 25 ways (numbers can be repeated). Hence, the there are 25 * 5 = 125 such numbers.

60. Ans: (a)

Sol: Along the path y = mx

$$\lim_{(x,y)\to(0,0)} \frac{x^2 - xy}{\sqrt{x} - \sqrt{y}} = \lim_{x\to 0} \frac{x^2 - mx^2}{\sqrt{x} - \sqrt{mx}}$$

$$= \lim_{x\to 0} \frac{x^2(1-m)}{\sqrt{x}\left(1-\sqrt{m}\right)} = \lim_{x\to 0} \frac{x^{\frac{3}{2}}(1-m)}{\left(1-\sqrt{m}\right)} = 0$$

61. Ans: (c)

Sol: Given that $\frac{dy}{dx} = 1 + y^2$

$\Rightarrow \int \frac{1}{1+y^2} dy = \int dx + c$

$\Rightarrow \tan^{-1}(y) = x + c$

$\therefore$ y = tan (x + c) is the required solution

62. Ans: (d)

Sol: Given $(D^2 - 4D + 4)\, y = 0$ ..... (1)

The Auxiliary equation is

$D^2 - 4D + 4 = 0$

$\Rightarrow (D - 2)^2 = 0$

$\Rightarrow$ D = 2, 2 [roots are real and equal]

$\therefore$ $y = (c_1 + c_2 x)\, e^{2x}$ is the required solution of equation (1)

63. Ans: (b)

Sol: Let $f(x) = x - \cos x = 0$

The curves y = x and y = cosx intersect at only one point in the interval $(0, \pi)$.

$\therefore$ The equation has exactly one solution in $[0, \pi]$.

64. Ans: (d)

Sol: Consider $|e^{jz}| = |e^{j(x+jy)}|$

$\Rightarrow$ $|e^{jz}| = |e^{jx-y}|$

$= |e^{-y}|\,|e^{jx}|$

$\therefore$ $|e^{jz}| = e^{-y}$

65. Ans: (c)

Sol: WBS is a multi level diagram which describes the project deliverables.

66. Ans: (d)

67. Ans: (a)

Sol: In BOT (Build –Operate – Transfer) type contract, the contractor has to recover his investment in the form of user charges.

Eg: Toll system in highways

68. Ans: (c)

Sol: Monoclinic Crystal System:

$a \neq b \neq c$ $\alpha = \beta = 90^o \neq \gamma$

Number of independent variables required to define monoclinic system is 4(a, b, c, γ)

69. Ans: (c)

Sol: Completely reversible loads are more dangerous because of more stress amplitude and materials are designed based on there loads only.

Flucheating loads are more safer because of low stress amplitude.

Alternating loads varying both direction and magnitude.

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70. Ans: (b)

Sol: Eutectic reaction:

$$\text{Liquid} \rightleftharpoons \text{Solid}_1 + \text{Solid}_2$$

$$\text{Liquid} \overset{4.2\%C}{\underset{1100^oC}{\rightleftharpoons}} \text{Austenite} + \text{Cementite}$$

71. Ans: (a)

72. Ans: (d)

Sol:

Nano particle Synthesisation

Top-Down Approach
1. Ball Milling
2. Lithography

Bottom-Up Approach
1. Sol gel technique
2. CVD & PVD
3. Molecular Self Assembly

73. Ans: (d)

Sol: At receiver site in email architecture MTA will take message from email server and deliver to user agent under IMAP or POP 3.
Internet message access protocol download and maintains copy in mail server while POP 3 (Post office protocol version 3) only download mail in hard drive.

74. Ans: (b)

Sol: There are two types of modes that processor executes one is called user mode other one system mode, when user provides some input and CPU reacts on it then its comes under user mode.
So, option (a) is incorrect.
When CPU reacts on input given by OS then it comes under system mode.
Hence, option (b) is correct.
Simplex mode, it allows one way sending and receiving traffic, not related to working of CPU.
Hence, option (c) is incorrect.

75. Ans: (a)

Sol: The satellites of NASA had discovered 'First Nearby Super-Earth'. It is a planet that could possibly support life. The team of International Astronomers announced their findings in the publication Astronomy and Astrophysics. The new discovery is known as an exoplanet. It is basically a planet that orbits a star outside of our solar system.

76. Ans: (d)

Sol: LiDAR is a surveying method that measures distance to a target by illuminating the target with laser light and measuring the reflected light with a sensor. Differences in laser return times and wavelengths can then be used to make digital 3-D representations of the target.

77. Ans: (a)

Sol: Statement (1) is true, while statement (2) is a definition of identity theft and statement (3) is definition of denial of service attack.

78. Ans: (a)

Sol: Questions must always be asked to relavent person, otherwise finding root cause becomes impossible to achieve.

79. Ans: (c)

Sol: OEE = performance × yield × availability

80. Ans: (d)

81. Ans: (d)

Sol:

- Also known in the Arab world as Daesh and by the acronyms ISIS and ISIL, Islamic State has been the deadliest terrorist group in the world for the past three years. Its home territory is Syria and Iraq but it remains capable of launching attacks parts of the Middle East as well as Europe and Asia.
- The Afghan based Taliban group has been waging a war of attrition with the U.S.-backed coalition since 2001 and has proven remarkably resilient.
- The extremist militant group Al-Shabaab emerged in 2006. It is an affiliate of Al-Qaida and while its main area of operations is Somalia, it has also carried out attacks in Ethiopia, Kenya and Uganda.
- The Nigerian terrorist group Boko Haram was once the world's deadliest terror group but it has been in decline since 2014 and has recently started to splinter into different factions, the largest of which is the Islamic State West African Province (ISWAP).

82. Ans: (a)

Sol: As part of the ongoing initiatives to enhance self-reliance in defence, the Mission Raksha Gyan Shakti aims to provide a boost to the IPR culture in indigenous defence industry.

83. Ans: (d)

84. Ans: (a)

Sol: The yield curve is a graph showing the relationship between interest rates earned on lending money for different durations.

Normally, someone who lent to the government or a corporation for one year (by buying a one-year government or corporate bond) would expect to get a lower interest rate than someone who lent for five or ten years, making the yield curve upward-sloping.

In the US in recent days the ten-year bond rate has fallen to the point at which the ten-year rate is below the two-year rate – so the yield curve is inverted.

The yield curve turns negative when near-term Treasurys yield more than their long-term counterparts.

85. Ans: (c)

Sol: On 14 December, 2019, the Andhra Pradesh Legislative Assembly has passed the Andhra Pradesh Disha Bill, 2019 (Andhra Pradesh Criminal Law (Amendment) Act 2019). The bill provides for awarding death sentence for offences of rape and gangrape and expediting trials of such cases to within 21 days. Major provisions include completion of investigation in seven days and trial in 14 working days, where there is adequate conclusive evidence, and reducing the total judgment time to 21 days from the existing four months.

86. Ans: (b)

Sol: The Citizenship (Amendment) Act grants citizenship to the Hindus, Christians, Sikhs, Buddhist, Jains and Parsis-from Afghanistan, Pakistan and Bangladesh who had arrived in India before 31 December 2014. The Bill shall not apply to: Tribal areas of Assam, Meghalaya, Mizoram and Tripura as included in the sixth schedule of the Constitution.

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87. Ans: (c)

88. Ans: (d)

89. Ans: (a)
Sol: Increased sample size reduces the sum of producer's and consumer's risk. Lesser the errors, better is the decision making.

90. Ans: (d)
Sol: Taking more samples will consume more time but never beyond the time taken for 100% inspection.

91. Ans: (d)
Sol: Safety doesn't come under perview of 5s.

92. Ans: (c)
Sol: In case of immoral conduct, self is the moral agent and also punishing agent through corrections. It is incorrect to say that immoral conduct does not attract any punishment.

93. Ans: (b) **94. Ans: (a)**

95. Ans: (a) **96. Ans: (a)**

97. Ans: (a)

98. Ans: (c)
Sol: Different cash flows are considered in payback period.

99. Ans: (a)
Sol: Estimation helps the customer to compare whether the quotation is satisfactory or not

100. Ans: (a)
Sol: The Gray costiron material consists of graphite flakes within pearlite and cementite. Due to presents of there flakes the gray castiron possess high damping capacity and they can transfer vibrations from machine tool to the earth.