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ESE 2020 : Prelims Exam
CLASSROOM TEST SERIES

GENERAL STUDIES & ENGINEERING APTITUDE

Answer Key & Solutions of
Test No. 23

Full Syllabus Test 7

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

Note: The answer key of Q. No. 67 has been updated

DETAILED EXPLANATIONS

1. (a)

- The tax rates, rules and regulations regarding GST are governed by the GST Council which is headed by Union Minister of Finance.
- Union Cabinet has cleared a proposal to convert the GSTN into a Government-owned company. Under this, the Centre to own a 50% stake in the GST Network and the remainder will be held by the States/UTs on a pro-rata basis in the new structure.
- Earlier, Union Government and State/UT Governments hold 49% equity while 51% equity was with non-Government financial institutions.

2. (d)

- According to the Aadhaar Act, 2016, every resident can apply for an Aadhaar number. For Aadhaar, a resident is an individual who has been living in the country for 182 days or more in the year immediately preceding the date of application for enrollment.
- A child below 18 years of age can also avail Aadhaar card.
- UIDAI has been made a statutory body under Aadhaar (Targeted Delivery of Financial and Other Subsidies, Benefits and Services) Act, 2016 or popularly known as Aadhaar Act, 2016.

3. (d)

- Balance of Payment (BOP) is a statement which records all the monetary transactions made between residents of a country and the rest of the world during any given period.
- BOP statement of a country indicates whether the country has a surplus or a deficit of funds i.e. when a country's export is more than its import, its BOP is said to be in surplus. On the other hand, BOP deficit indicates that a country's imports are more than its exports.
- Loans by IMF to its member countries (In this case-India), exports and imports of goods and services, remittances, etc. are included in BOP.

4. (b)

- **M0 (Reserve Money):** Currency in circulation + Bankers' deposits with the RBI + Other deposits with the RBI.
- **M1:** Currency with the public + Deposit money of the public (Demand deposits with the banking system + 'Other' deposits with the RBI).

5. (a)

- Dutch disease is an economic term for the negative consequences that can arise from a spike in the value of a nation's currency.
- It is primarily associated with the new discovery or exploitation of a valuable natural resource and the unexpected repercussions that such a discovery can have on the overall economy of a nation.

6. (a)

- Micro Units Development & Refinance Agency (MUDRA) is an institution set up by Government of India to provide funding to the non-corporate, non-farm sector income generating activities of micro and small enterprises whose credit needs are below 10 Lakh.
- Under the aegis of Pradhan Mantri MUDRA Yojana (PMMY), MUDRA has created three financial products namely 'Shishu', 'Kishore' and 'Tarun' as per the stage of growth and funding needs of the beneficiary micro unit.
- These schemes cover loan amounts as below:

(i) Shishu: covering loans up to Rs.50,000
(ii) Kishore: covering loans above Rs.50,000 and up to Rs.5,00,000
(iii) Tarun: covering loans above Rs.5,00,000 and up to Rs.10,00,000

8. (a)

In Sarnath Lion Capital, the four voluminous roaring lion figures firmly stand on a circular abacus which is carved with the figures of four animals – a striding elephant, a galloping horse, a walking bull and a prancing lion.

9. (d)

$$\frac{dy}{dx} = x + y$$

Initial condition $x_0 = 0, y_o = 1$

Given $h = 0.1$

$$y_1 = y_0 + hf(x_0, y_o) = 1 + 0.1\,(x_0 + y_0)$$
$$= 1 + 0.1\,(0 + 1) = 1.1$$
$$x_1 = 0.1,\ y_1 = 1.1$$
$$y_2 = y_1 + hf(x_1, y_1) = 1.1 + 0.1\,(x_1 + y_1)$$
$$= 1.1 + 0.1\,(0.1 + 1.1) = 1.22$$

10. (c)

Characteristic equation,

$$|A - \lambda I| = 0$$

$$\begin{vmatrix} 1-\lambda & 2 \\ 2 & -1-\lambda \end{vmatrix} = 0$$

$$(1 - \lambda)(-1 - \lambda) - 4 = 0$$
$$-1 - \lambda + \lambda + \lambda^2 - 4 = 0$$
$$\lambda^2 - 5 = 0$$

By Cayley Hamilton theorem

$$A^2 = 5I$$

$$A^4 = 25I = 25\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 25 & 0 \\ 0 & 25 \end{bmatrix}$$

11. (d)

Let $y = x^x$

Taking logarithm of both sides, we get

$$\ln y = x\ln x$$

Differentiating w.r.t. x, we get

$$\frac{1}{y}\frac{dy}{dx} = x\frac{1}{x} + \ln x \cdot 1$$

$$\frac{dy}{dx} = y(1 + \ln x)$$

$$= x^x(1 + \ln x)$$

12. (c)

Case I: For $-5 \le x \le -2$, $x + 2 \le 0$

$$|x+2| = -(x + 2)$$

Case II: For $-2 \le x \le 5, x + 2 \ge 0$

$$|x+2| = x + 2$$

$$\therefore \int_{-5}^{5} |x+2|\,dx = \int_{-5}^{-2} |x+2|\,dx + \int_{-2}^{5} |x+2|\,dx$$

$$= \int_{-5}^{-2} -(x+2)\,dx + \int_{-2}^{5} (x+2)\,dx$$

$$= -\left[\frac{x^2}{2} + 2x\right]_{-5}^{-2} + \left[\frac{x^2}{2} + 2x\right]_{-2}^{5}$$

$$= (-2 + 4) - \left(-\frac{25}{2} + 10\right) + \left(\frac{25}{2} + 10\right) - (2 - 4)$$

$$= 2 - \left(\frac{-5}{2}\right) + \frac{45}{2} + 2 = 29$$

13. (b)

$$\nabla\bar{A} = 4xz - 2xyz + 6yz$$

$$\nabla\bar{A}|_{(1,1,1)} = 4 - 2 + 6 = 8$$

14. (c)

The singular point of given function is $z = 0$

By Cauchy's integral formula

$$\oint \frac{f(z)}{z} dz = 2\pi i f(0)$$

$$= 2\pi i\,(2 \times 0 + 3) = 6\pi i$$

15. (b)

Probability of only one of them quality

$$= P(E \cap F') + P(E' \cap F)$$

$$= P(E) - P(E \cap F) + P(F) - P(E \cap F)$$

$$= 0.05 - 0.02 + 0.10 - 0.02 = 0.11$$

16. (d)

$$L^{-1}\left(\frac{s+2}{s^2-4s+13}\right) = L^{-1}\left(\frac{s+2}{(s-2)^2+9}\right)$$

$$= L^{-1}\left(\frac{s-2+4}{(s-2)^2+3^2}\right)$$

$$= L^{-1}\left(\frac{s-2}{(s-2)^2+3^2}\right) + 4L^{-1}\left(\frac{1}{(s-2)^2+3^2}\right)$$

$$= e^{2t}\cos 3t + \frac{4}{3}e^{2t}\sin 3t$$

17. (b)

Statement (b) is most specific to competitive performance benchmarking and statement (a) and (c) is most appropriate to benchmarking and statement (d) is true for reverse engineering.

18. (b)

For estimating relative priorities of products by following steps.

Step I: Sum of values in each column of pairwise comparison matrix.

Step II: Divide each element by its column total, to obtain normalized pairwise comparison matrix.

Step III: Compute average in each row which gives priority column.

	P - I	*P - II*	*P - III*
P - I	1	4	8
P - II	$\frac{1}{4}$	1	3
P - III	$\frac{1}{8}$	$\frac{1}{3}$	1
sum	$\frac{11}{8}$	$\frac{16}{3}$	12

Step-2:

	P - I	P - II	P - III
P - I	$\frac{8}{11}$	$\frac{12}{16}$	$\frac{8}{12}$
P - II	$\frac{2}{11}$	$\frac{3}{16}$	$\frac{3}{12}$
P - III	$\frac{1}{11}$	$\frac{1}{16}$	$\frac{1}{12}$

Step-3:

	P - I	P - II	P - III	average
P - I	$\frac{8}{11}$	$\frac{12}{16}$	$\frac{8}{12}$	x
P - II	$\frac{2}{11}$	$\frac{3}{16}$	$\frac{3}{12}$	y
P - III	$\frac{1}{11}$	$\frac{1}{16}$	$\frac{1}{12}$	z

$$x = \frac{\frac{8}{11}+\frac{12}{16}+\frac{8}{12}}{3} = \frac{\left(\frac{8\times16}{11}\right)+\frac{12}{16}+\left(\frac{8\times16}{12}\right)}{3}$$

$$x = \frac{1}{48}\left[\frac{128}{11}+12+\frac{32}{3}\right]$$

$$x = \frac{1}{48}[11.6+12+10.6]$$

$$= x = \frac{34.2}{48}$$

$$y = \frac{\frac{2}{11}+\frac{3}{16}+\frac{3}{12}}{3}$$

$$y = \frac{1}{48}\left[\frac{2\times16}{11}+3+\frac{3\times16}{12}\right]$$

$$y = \frac{1}{48}\left[\frac{32}{11}+3+\frac{48}{12}\right]$$

$$y = \frac{1}{48}[2.9+3+4] = \frac{9.9}{48}$$

$$z = \frac{\frac{1}{11}+\frac{12}{16}+\frac{1}{12}}{3}$$

$$z = \frac{1}{48}\left[\frac{16}{11} + 12 + \frac{1\times 16}{12}\right]$$

$$z = \frac{1}{48}[1.4 + 12 + 1.30]$$

$$z = \frac{14.7}{48}$$

Priority rating $x > z > y$

$P\text{-}I > P\text{-}III > P\text{-}II$

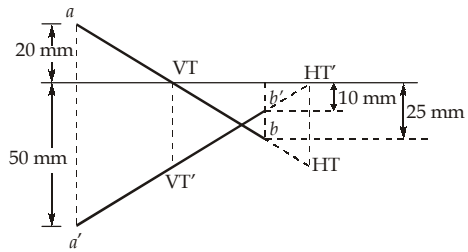
19. (a)

	Cost	Durability	Time to produce	Final score
Butt hinge	0.2 × 0.7 = 0.14	0.12 × 0.1 = 0.012	0.7 × 0.2 = 0.14	0.292
Flush hinge	0.08 × 0.7 = 0.056	0.7 × 0.1 = 0.07	0.18 × 0.2 = 0.036	0.162
Barrel hinge	0.6 × 0.7 = 0.42	0.12 × 0.1 = 0.012	0.07 × 0.2 = 0.014	0.446

20. (a)

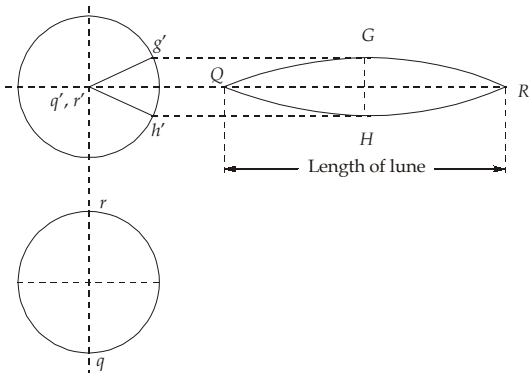
- In progressive or parallel dimensioning, all dimensions are shown from a common base.
- Dimensions of a cylinder should be given as diameter.
- Dimension of arcs of circle should be given by their respective radii.

21. (d)



Hence, in orthographic drawing both top view of horizontal trace and front view of vertical trace lie below the reference line.

22. (d)



Length of lune = Length of arc qr = $\pi . r = 25\pi$ mm

23. (c)

- Weighted decision matrix is a method of evaluating competing concepts by ranking the design criteria with weighting factor and scoring the degree to which each design concept meets the criterion. To do this it is necessary to convert the values obtained for different design criteria into a consistent set of values.
- For the selection of solution, it is first necessary to reduce the usual long list of generated concepts to manageable proportion. It is recommended that a maximum of six concepts should be chosen for further investigation. The selected concepts are subjected to a formal evaluation procedure according to a modified form of what is known as the Harris method. In this method list of evaluation criteria is established and each criterion is standardized according to the strategic objectives of the company.

24. (c)

Since divisor is always greater than remainder, only option (c) ie. D = 40 is possible.

Alternatively:

$$\frac{A}{D} \rightarrow \text{Remainder } 13$$

$$\frac{B}{D} \rightarrow \text{Remainder } 31$$

$$\frac{A+B}{D} \rightarrow \text{Remainder should be } 44$$

But it is given that the remainder is 4.
Hence, the divisor must be 40 (= 44 – 4).

25. (c)

$$\angle OCA = \angle OAC = 25°$$
$$\angle OCB = \angle OBC = 35°$$
$$\therefore \quad \angle ACB = \angle ACO + \angle BCO = 25° + 35° = 60°$$
$$\therefore \quad \angle AOB = 2\angle ACB = 120°$$

26. (b)

ASSISTANT → AA I N SSS TT
STATISTICS → A II C SSS TTT

Here N and C are not common and same letters can be A, I, S, T. Therefore

$$\text{Probability of choosing } A = \frac{{}^2C_1}{{}^9C_1} \times \frac{{}^1C_1}{{}^{10}C_1} = \frac{1}{45}$$

$$\text{Probability of choosing } I = \frac{1}{{}^9C_1} \times \frac{{}^2C_1}{{}^{10}C_1} = \frac{1}{45}$$

$$\text{Probability of choosing } S = \frac{{}^3C_1}{{}^9C_1} \times \frac{{}^3C_1}{{}^{10}C_1} = \frac{1}{10}$$

$$\text{Probability of choosing } T = \frac{{}^2C_1}{{}^9C_1} \times \frac{{}^3C_1}{{}^{10}C_1} = \frac{1}{15}$$

$$\text{Hence, required probability} = \frac{1}{45} + \frac{1}{45} + \frac{1}{10} + \frac{1}{15} = \frac{19}{90}$$

27. (a)

In one hour pipe A can fill $= \frac{1}{30}$ part of the tank

In one hour pipe B can fill $= \frac{1}{45}$ part of the tank

In two hours, pipes A and B can fill $= \frac{1}{18}$ part of the tank

Therefore in 36 hours the tank will be completely filled.

Alternatively: Efficiency of Pipe A = 3.33%

Efficiency of pipe B = 2.22%

and Combined efficiency = 5.55%

Therefore in 2 hours, pipe A and B fill 5.55%. Thus to fill 100% tank, these pipes will take $\frac{100}{5.55} = 36$ hours.

28. (c)

Speed of first person = $30 \times \frac{18}{5}$ km/hr = 108 km/hr.

Speed of second person = $\frac{125}{6} \times \frac{18}{5}$ km/hr = 75 km/hr.

The first person covers 1080 km in 10 hours and thus he makes 12 rounds. Thus, he will pass over another person 12 times in any one of the direction.

29. (b)

The equation of any line passing through the point of intersection of the lines $x + 2y - 3 = 0$ and $4x - y + 7 = 0$ is

$$x + 2y - 3 + k(4x - y + 7) = 0 \quad \ldots(1)$$

or $$(1 + 4k)x + (2 - k)y + (7k - 3) = 0 \quad \ldots(2)$$

$$m_1 = \text{Slope of the line (2)} = \frac{4k+1}{k-2}$$

and $$m_2 = (\text{Slope of the line } y - x + 10 = 0) = 1$$

If the line (1) be parallel to the line $y - x + 10 = 0$

then $$\frac{4k+1}{k-2} = 1 \Rightarrow k = -1$$

Hence from (1), the required equation of the line is

$$(x + 2y - 3) - 1(4x - y + 7) = 0$$

$$\Rightarrow \quad 3x - 3y + 10 = 0$$

30. (a)

When a spherical ball is cut into four similar pieces, we get each piece made up of 2 non-polished semi-circles and $\frac{1}{4}$ of the polished spherical surface. Hence each piece has a polished area of $\left(\frac{1}{4}\right)\times 4\pi r^2 = \pi r^2$ and non-polished area of $2\left(\frac{1}{2}\pi r^2\right) = \pi r^2$.

Therefore the ratio of polished area to the non-polished area is 1 : 1.

31. (d)

$$3^x + 3^{x+1} = 36$$
$$\Rightarrow \quad 3^x + 3.3^x = 36$$
Let $\quad 3^x = k$
$$\therefore \quad k + 3k = 36 \quad \Rightarrow k = 9$$
$$\therefore \quad 3^x = 9 \quad \Rightarrow x = 2$$
$$\therefore \quad x^x = 2^2 = 4$$

32. (a)

$$x^2 - 4 = (x+2)(x-2)$$
$$(x^2 - 5x - 6) = (x+1)(x-6)$$
$$(x^2 + x - 6) = (x-2)(x+3)$$

Since there is no common factor, so HCF is 1.

33. (c)

$$x^3 + 1 \geq x^2 + x$$
$$\Rightarrow \quad x^3 - x^2 - x + 1 \geq 0$$
$$\Rightarrow \quad (x-1)^2 (x+1) \geq 0$$
$$\Rightarrow \quad x \geq -1$$

34. (c)

These are types of inspection of Standard sampling plans. The general inspection level is selected prior to implementing the sampling plan, but the type of inspection normal, tightened, or reduced is dedicated by the outcomes of the inspection process.

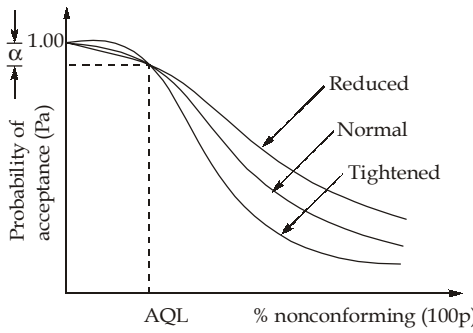


Fig: Effect of inspection type on the OC curve

Out of the three, Tightened inspection has the most stringent requirements and the most discriminatory power.

35. (d)

$$AOQ = P_a \times p \times \left(\frac{N-n}{N}\right)$$

$$= 0.01 \times 0.9397 \times \frac{10000-89}{10000} = 0.0093$$

37. (d)

It is a surface NDT method. Any flaw which is limited at surface is detected by liquid penetration test. Ease and flexibility are two aspect which makes die penetration test most popular method. All sorts of surfaces like metal, grass, ceramics, rubber and plastics are checked. Fatigue crack which starts at surface will be limited on surface. Hence this method is used.

38. (c)

For R= chart, $\bar{R} = 2.3$

$$\text{UCL} = D_4 \times \bar{R} = 2.11 \times 2.3 = 4.853$$

$$\text{LCL} = D_3 \times \bar{R} = 0$$

39. (a)

Acoustic emission testing, kaiser effect tells about relationship between acoustic emission event and the previous load history. Kaiser effect describes acoustic emission for completely loading cycle occurring when the structure is loaded first to threshold, unloaded and then loaded again. It states no acoustic emission is generated until the previous maximum load is exceeded. Emission that occur in later loading below the previous maximum load is due to structural damage.

41. (c)

Six sigma created a renewed focus on process improvement six sigma uses seven quality control tools for process improvement. Following are application of the seven QC tools in six sigma.

Tool	DMAIC application
Pareto chart	Analyse
Cause-and-effect diagram	Analyse
Check sheet	Measure, analyese
Histogram	Measure, analyse
Scatter diagram	Analyese, improve
Control chart	Control

42. (d)

Seven new Quality Control tools often called as management and planning tools are used for problem solving have proved useful in areas such as product quality improvement, cost reduction, new product development and policy deployment. They are beneficial to the top-and middle management in an organization for strategic planning, goal setting and problem solving. They are not replacements for the old seven tools. Seven new quality control tools are given below:

1. Affinity diagram.
2. Relationship diagram.
3. Systematic/tree diagram.
4. Matrix diagram.
5. Matrix data analysis method.
6. Arrow diagram.
7. Process decision program chart.

43. (b)

- In a pond ecosystem, the producers are phyto- plankton such as algae, bacteria etc., which are maximum in number. The small herbivorous fish, rotifers etc. are smaller in number than producers, while the small carnivorous fishes are even less in number. Finally, the apex consumers or biggest carnivorous fish are least in number. Therefore, the pyramid of numbers is upright in pond ecosystem.
- In the pond ecosystem, the biomass can increase at higher trophic levels with the carnivorous fish having the largest biomass. Thus, the pyramid of biomass is inverted.
- Pyramid of Energy is always upright.

45. (d)

The Montreal Protocol on Substances that Deplete the Ozone Layer is an international treaty designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion.

46. (a)

- Desertification, along with climate change and the loss of biodiversity were identified as the greatest challenges to sustainable development during the 1992 Rio Earth Summit. Adopted in 1994, United Nations Convention to Combat Desertification (UNCCD) entered into force in 1996 and became a legally binding international agreement linking environment and development to sustainable land management.
- India became a signatory to UNCCD on 14th October 1994 and ratified it on 17th December 1996.

47. (d)

- The main source of sulphur dioxide in the air is industrial activity that processes materials that contain sulfur, e.g. the generation of electricity from coal, oil or gas that contains sulfur. Some mineral ores also contain sulfur, and sulphur dioxide is released when they are processed. In addition, industrial activities that burn fossil fuels containing sulfur can be important sources of sulfur dioxide.
- 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.

48. (a)

Under Intended Nationally Determined Contributions (INDCs), India's target consists of:

- Produce 40 percent of electricity from non-fossil fuel based energy resources by 2030, if the international community helps with technology transfer and low cost finance.
- Create an additional carbon sink of 2.5 to 3 billion tonnes of carbon dioxide equivalent by 2030 through additional forest and tree cover.
- Develop robust adaptation strategies for agriculture, water and health sectors.
- Reduce emission intensity by 33 to 35 percent by 2030 compared to 2005 levels.

49. (c)

The main steps in the Environmental Impact Assessment (EIA) process are:

1. Screening
2. Scoping
3. Prediction and Mitigation
4. Management and Monitoring
5. Audit

51. (c)

- Species diversity is defined as the number and abundance of different species that occupy a location. Species diversity increases the number of links in the food web.
- There can be various reasons for the stability of the ecosystem because of species diversity. Increased food web diversity increases the resilience of the system to outside invasions of exotic organisms and reduces the fluctuation in the population within a given ecosystem.

52. (c)

Plants that do not occur naturally in a region but proliferate in the area they have been introduced into, and cause several negative impacts (such as affecting native biodiversity, causing economic losses and harming human health) in these new habitats, are called invasive plants.

53. (d)

One of the methods of addressing the lifecycle costing problem is to make one company responsible for all aspects of the product lifecycle, thus eliminating any short term construction gains. The PPP falls into category where a company is given a license to finance, build and operate a facility.

54. (b)

The initiating process makes the GO/NO-GO decision to start the project.

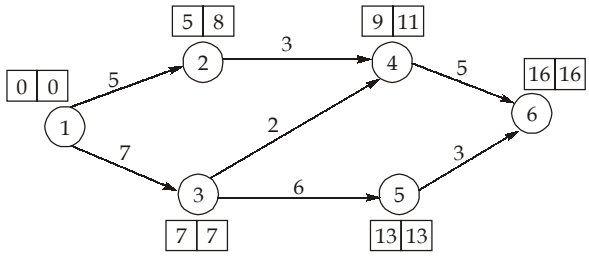
55. (d)

SPI is needed to calculate schedule of the project.
CPI is used to estimate the budget of project.

58. (a)

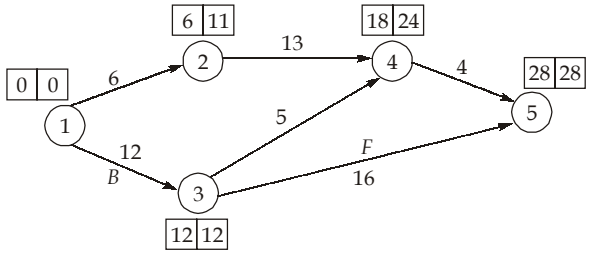
Initially, total cost decreases with increase in time then it increases after an optimum time.

59. (a)



1 – 3 – 5 – 6

60. (d)



$$\sigma_{1-3} = \frac{21-3}{6} = 3$$

$$\sigma_{3-5} = \frac{30-6}{6} = 4$$

Variance of project $= 3^2 + 4^2 = 25$

Standard deviation $= \sqrt{25} = 5$ days

61. (d)

$$Z = \frac{T_S - T_E}{\sigma} = \frac{45-42}{3} = 1$$

Probability of completing the project in less than 45 days is 84.13%
Hence probability of completion in more than 45 days = 100 – 84.13 = 15.87%.

62. (b)

Under longitudinal load, the elastic modulus of composite approaches that of fibre as the volume fraction of fibre increases.

63. (a)

Nylon is an example of thermoplastic polymer.

64. (c)

Cermets are composed of extremely hard particles of refractory carbide ceramic such as tungsten carbine (WC) embedded in matrix of metal such as cobalt.

65. (d)

Cast iron shows brittle failure and have better ability to damp vibrations.

67. (c)

Muntz metal – 60% Cu + 40% zinc
Naval brass – 60% Cu + 39.2% zinc + 0.75 tin

68. (a)

Alumina do not have a good tensile strength but it can be improved by mixing them with Zirconium.

69. (c)

Diamagnetism exists for all systems containing electrons but positive magnetism can arise only in such materials which have a permanent magnetic moment.

70. (a)

Saturation value of the flux density depends on the chemical constitution and temperature and does not depends on the imperfections.

73. (a)

$$\mu_p = \alpha E$$

$$\alpha = \text{Polarizability} = \frac{\chi_e \varepsilon_o}{N}$$

74. (c)

For extrinsic semiconductor.

$$R_H = \frac{1}{\text{Charge} \times \text{Carrier concentration}}$$

In extrinsic semiconductor, carrier concentration is majority carrier concentration and it is independent of temperature and thus R_H is independent of temperature.

77. (c)

ROM is a non-volatile memory

79. (c)

Quantum enabled Science and technology (QuEST) program was initiated to develop core expertise in development of Quantum mechanics so as to realize Quantum computers.

85. (d)

- Courageous action must be voluntarily.
- Courage involves presence of danger, loss, risk or potential injury.
- Courage involves mastery on fear.

86. (c)

- Kickbacks are pre-arranged payments by contract to departmental officials in exchanges for actually granted contracts.
- The quality, motive, price and timing of gift given can be considered as a bribe.

88. (b)

Collegiality is not exclusively related to environmental ethics.

90. (d)

Ethical Codes create minimum level of ethical conduct and promote agreement within the profession. Protecting the ***status quo*** is one of the essential roles of Ethical Codes.

91. (c)

The World Trade Organization does not regulate the actions of companies engaged in dumping, but instead focuses on how governments can or cannot react to dumping.

92. (b)

The Organisation of Petroleum Exporting Countries (OPEC) is based on cartel that cooperates with member countries to reduce market competition with an aim of controlling prices. Cartel is basically a combination where sellers or service providers come together with an aim of mainly controlling prices.

Headquarters of OPEC: Vienna (Austria)

93. (d)

Line whose top view is parallel to reference line, will show its true length in front view and projection of front view will be in vertical plane.

95. (b)

Both statements are correct. Definition of sampling scheme and sampling system are given in statements.

97. (c)

The hydrologic cycle is a conceptual model that describes the storage and movement of water between the atmosphere, lithosphere, and the hydrosphere.

Water moves from one reservoir to another by way of processes like evaporation, condensation, precipitation, deposition, runoff, infiltration, sublimation, transpiration, melting, and groundwater flow.

99. (a)

The transition elements such as rare earths and the elements belonging to the iron group have incompletely filled shells and therefore these elements have orbital dipole moments.

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