MADE EASY

India's Best Institute for IES, GATE & PSUs

ESE 2020 : Prelims Exam
CLASSROOM TEST SERIES

GENERAL STUDIES & ENGINEERING APTITUDE

Answer Key & Solutions of
Test No. 17

Full Syllabus Test 1

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

DETAILED EXPLANATIONS

1.   (b)

- The Global Hunger Index (GHI) is a tool designed to comprehensively measure and track hunger at global, regional, and national levels. GHI scores are calculated each year to assess progress and setbacks in combating hunger.
- The index is based on Goal 2 of Sustainable Development Goals (SDGs) adopted by United Nations Development Programme (UNDP).
- For each country, GHI values are determined for four indicators: Undernourishment (the share of the population that is undernourished; Child Wasting (the share of children under the age of five who have low weight for their height, reflecting acute undernutrition); Child Stunting (the share of children under the age of five who have low height for their age, reflecting chronic undernutrition); and Child Mortality (the mortality rate of children under the age of five).

2.   (d)

- The Fiscal Responsibility and Budget Management (FRBM) Act was enacted in 2003 which set targets for the Government to reduce fiscal deficits.
- In May 2016, the Government set up a committee under N.K. Singh to review the FRBM Act. The committee recommended that the Government should target a fiscal deficit of 3 per cent of the GDP in years up to March 31, 2020 cut it to 2.8 per cent in 2020-21 and to 2.5 per cent by 2023.

6.   (c)

Department of Biotechnology, Ministry of Science and Technology has launched UMMID (Unique Methods of Management and treatment of Inherited Disorders) initiative to tackle inherited genetic diseases of new-born babies.

8.   (d)

In matrices AB = 0 does not necessarily mean that either A = 0 or B = 0.

9.   (a)

If x_1 and x_2 are two solutions of a linear homogeneous system, then $\alpha x_1 + \beta x_2$ is also a solution of the homogeneous system for any scalars α, β. This result does not hold for non-homogenous systems.

10.   (a)

We have,

$$M = x^3 + y \text{ and } N = ax + by^3$$

$$\frac{\partial M}{\partial y} = 1 \text{ and } \frac{\partial N}{\partial x} = a$$

Hence, if $a = 1$, the equation is exact.

11.   (c)

$$\lim_{x \to 0} \frac{1 - \cos(2x)}{x^2} \quad ; \quad \frac{0}{0} \text{ form}$$

Applying L' Hospital rule

$$\lim_{x \to 0} \frac{2\sin(2x)}{2x}; \frac{0}{0} \text{ form}$$

Applying L' hospital rule

$$\lim_{x \to 0} \frac{4\cos 2x}{2} = 2$$

12.   (d)

$$a_o = \frac{1}{\pi} \int_{-\pi}^{\pi} x\,dx = 0 \qquad (x \text{ is an odd function on } [-\pi, \pi])$$

$$a_n = \frac{1}{\pi} \int_{-\pi}^{\pi} x\cos nx\,dx = 0 \quad (x\cos nx \text{ is an odd function on } [-\pi, \pi])$$

$$b_n = \frac{1}{\pi} \int_{-\pi}^{\pi} x\sin nx\,dx \quad (x\sin nx \text{ is an even function on } [-\pi, \pi])$$

$$= \frac{2}{\pi} \int_0^{\pi} x\sin nx\,dx = \frac{2}{\pi}\left[-x\left(\frac{\cos nx}{n}\right) + \left(\frac{\sin nx}{n^2}\right) \right]_0^{\pi}$$

$$= \frac{2}{\pi}\left[\frac{-(\pi\cos n\pi)}{n} \right] = \frac{2}{n}(-1)^{n+1}$$

13.   (c)

The integral is not analytic at the point $z = -1$. Which lies inside C. Using the Cauchy integral formula for derivatives ($n = 3$) with $f(z) = 3z^4 + 5z^2 + 2$,
We obtain

$$I = \frac{2\pi i}{3!}\left[\frac{d^3}{dz^3}(3z^4 + 5z^2 + 2) \right]_{z=-1}$$

$$= \frac{2\pi i}{6}[72z]_{z=-1} = -24\pi i$$

14.   (b)

The Newton-Raphson method is of order 2 and has quadratic convergence.

15.   (c)

The probability that at least one of them will solve the problem is given by
$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$= 0.90 + 0.75 - (0.9)(0.75) = 0.975$$

16.   (a)

The curves intersect at the points where $\sqrt{x} = x^2$

or $x^4 - x = 0$, that is at $x = 0$ and $x = 1$. Since

$$\text{Area} = \int_0^1 \left[\sqrt{x} - x^2\right] dx$$

$$= \frac{2}{3} - \frac{1}{3} = \frac{1}{3} \text{ square units}$$

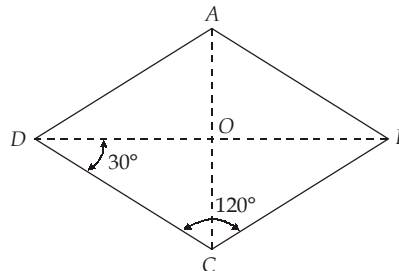**17.   (a)**

In isometric projection of face $ABCD$ will be shown as rhombus
So, $\angle AOD = 90°; \angle ODC = 30°$
$\angle OCD = 60°$

Diagonal BD of top face is parallel to vertical plane hence, BD will represent the true length,

So,   Diagonal's length $= \sqrt{2} \times$ side of cube

$$BD = \sqrt{2} \times \sqrt{3} \text{ mm}$$

and $$OD = \frac{BD}{2} = \frac{\sqrt{6}}{2} \text{ mm} = \sqrt{\frac{3}{2}} \text{ mm}$$
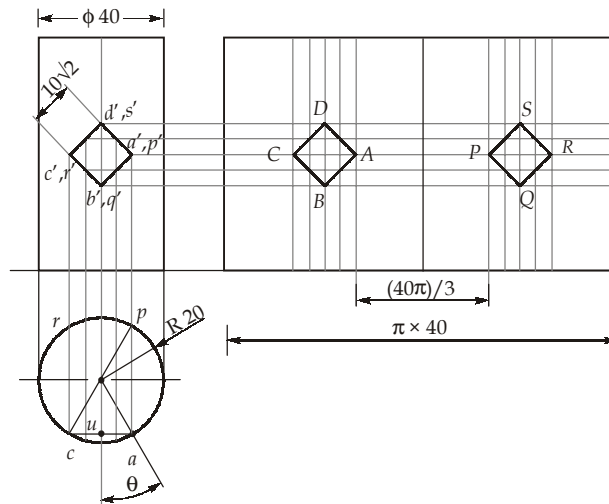
In $\triangle ODC$

$$\cos\angle ODC = \cos 30° = \frac{OD}{DC}$$

$\Rightarrow$ $$DC = \frac{OD}{\cos 30°} = \frac{\sqrt{3/2}}{\sqrt{3}/2} = \sqrt{2} \text{ mm}$$

18.   **(a)**

$$\text{Chord } ac = \sqrt{\left(10\sqrt{2}\right)^2 + \left(10\sqrt{2}\right)^2} = \sqrt{200 + 200} = \sqrt{400} = 20 \text{ mm}$$

From top view we get

$$\sin\theta = \frac{ua}{uo} = \frac{10}{20} = \frac{1}{2}$$
$$\theta = 30°$$

A little thinking helps to understand that
$$\angle AOP = 120°$$

$$\text{Arc } AP = \frac{120}{360} \times 40\pi = \frac{40\pi}{3} \text{ mm}$$

19.   **(b)**

Parallel line method is used for development of prism and cylinders. Radial line method is used for the development of pyramid and cones. Triangulation method is used for development of transition pieces. For development of doubly curved surfaces e.g. sphere, ellipsoid, paraboloid, approximation method is used.

20.   **(b)**

It is a retrograde Vernier scale in which n divisions on Vernier scale is equal to $(n + 1)$ divisions on main scale.
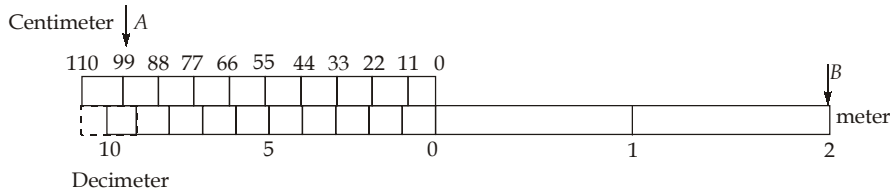
OB represents 2 meter OA represent 99 centimeter.

21.   **(a)**

Detail Design phase is the phase in which the design is brought to a state where it has the complete engineering description of a tested and a producible product. Any missing information about the arrangement, form, material, manufacturing process, dimensions, tolerances etc. of each part is added and detailed engineering drawing suitable for manufacturing are prepared.

22. **(b)**

Rating = weight factor × score

Overall rating score = rating of (cost of part + durability + time of produce + reliability)

Design Criteria	Weight factor	Butt Hinge		Flush Hinge		Barrel Hinge	
		Score	Rating	Score	Rating	Score	Rating
Cost of part	0.5	8	4.0	7	3.5	9	4.5
Durability	0.3	7	2.1	6	1.8	9	2.7
Time of produce	0.1	6	0.6	5	0.5	7	0.7
Reliability	0.1	6	0.6	5	0.5	8	0.8
Total			7.3		6.3		8.7

Overall score rating order is barrel hinge > butt hinge > flush hinge.

23. **(d)**

According to the systems theory of accident causation a situation in which an accident may occur as a system is composed of the following components: person (host), machine (agency), and environment.
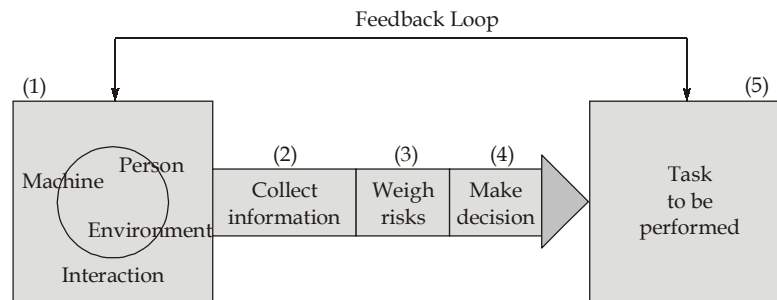
24. **(a)**

The EMS functions are the following:

- To establish a comprehensive environmental protection policy (planning).
- To identify all government regulations and requirements that apply to the organization's processes, products, or services (controlling).
- To establish organization-wide commitment to environmental protection (leading).
- To establish responsibility and accountability relating to environmental protection (organizing).
- To incorporate environmental concerns in all levels of organizational planning, including strategic, operational, and procedural (planning).
- To establish management processes for achieving performance benchmarks (controlling).
- To provide sufficient resources to ensure that performance benchmarks can be achieved on a continual basis (leading).

25. **(d)**

Let there be l steps on the escalator and x be the speed (in steps/second) of escalator, then

$$\frac{l}{(5+x)} = 10 \text{ and } \frac{l}{(5-x)} = 40$$

then

$$\frac{5+x}{5-x} = \frac{40}{10} \Rightarrow x = 3$$

∴ Number of steps on the escalator $= l = 8 \times 10 = 80$

26. **(a)**

∵ $\angle AOD$ is an external angle, $\angle ODC = \angle OCD = 26°$ (∵ $OD = OC$)

$$\angle AOD = \angle ODC + \angle OCD$$
$$= 52°$$

27. **(b)**

Let there be x coins of 25 paise denomination and y coins of 50 paise denomination, then

$$x + y = 40$$
$\Rightarrow$ $25x + 25y = 1000$ ...(1)
and $25x + 50y = 1275$ ...(2)

∴ Subtracting Eq. (1) from (2) we get

$$25y = 275$$
$\Rightarrow$ $y = 11$
∴ $x = 29$

28. **(b)**

Since divisor is $x + 3$

∴ $x + 3 = 0 \rightarrow x = -3$

∴ put $x = -3$ in the expression

$$3x^3 + 8x^2 - 6x + 1 = 3(-3)^3 + 8(-3)^2 - 6(-3) + 1$$
$$= -81 + 72 + 18 + 1 = 10$$

29. **(b)**

Let α, β be the roots of the given equation, then, $\alpha + \beta = p - 2$ and $\alpha\beta = -(p + 1)$

Now, $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta = (p - 2)^2 + 2(p + 1)$
$$= p^2 - 2p + 6 = (p - 1)^2 + 5$$

Clearly $\alpha^2 + \beta^2 \geq 5$. So minimum value of $\alpha^2 + \beta^2$ is 5, which it attains at $p = 1$

30. **(b)**

Let $E_1(i = 1, 2, 3$ etc.) denote the event of drawing an even numbered card in i^{th} draw and F_i ($i = 1, 2, 3$) denote the event of drawing an odd numbered card in i^{th} draw, then required probability

$$= P[(E_1 \cap F_2 \cap F_3) \cup (F_1 \cap E_2 \cap F_3) \cup (F_1 \cap F_2 \cap E_3)]$$
$$= P(E_1)P(F_2)P(F_3) + P(F_1)P(E_2)P(F_3) + P(F_1)\ P(F_2)P(E_3)$$

$$= \frac{4}{9} \times \frac{5}{9} \times \frac{5}{9} + \frac{5}{9} \times \frac{4}{9} \times \frac{5}{9} + \frac{5}{9} \times \frac{5}{9} \times \frac{4}{9} = 3 \times \frac{4 \times (5)^2}{(9)^3} = \frac{100}{243}$$

Alternative:

$$\text{Required probability} = {}^3C_1 \times \frac{4}{9} \times \frac{5}{9} \times \frac{5}{9} = \frac{100}{243}$$

31.   (b)

First and second prizes can be given in Mathematics in (30 × 29) ways.
First and second prizes can be given in Physics in (30 × 29) ways.
First prize can be given in Chemistry in 30 ways.
First prize can be given in English in 30 ways.
Hence, the number of ways to give prizes in all the four subjects is
   $(30 \times 29) \times (30 \times 29) \times 30 \times 30 = (30)^4 \times (29)^2$
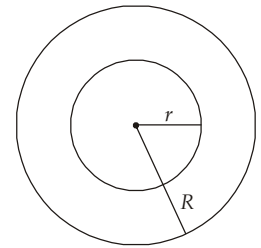
32.   (b)

$$\frac{r}{R} = \frac{3x}{4x}$$

$\because$ $4x - 3x = 2$

$\Rightarrow$ $x = 2$

$\therefore$ Outer radius $= 8$ cm

$\therefore$ Area of outer circle $= \pi \times (8)^2 = 64\pi$ cm^2

33.   (c)

$$\text{Work done in 11 days} = \frac{11}{30}$$

$$\text{Rest work} = \frac{19}{30}$$

$$\text{1 day's work of } A = \frac{19/30}{28} = \frac{19}{30 \times 28} = \frac{19}{840}$$

Total number of days required to complete the whole work alone by A

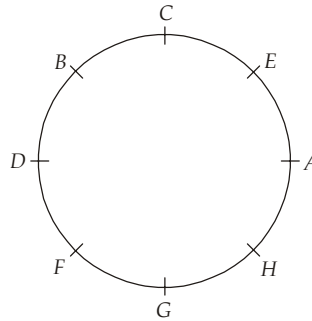$$= \frac{1}{19/840} = \frac{840}{19} = 44\frac{4}{19}\text{days}$$

Alternative:

$$11\left[\frac{1}{A} + \frac{1}{B}\right] + \frac{28}{A} = 1$$

$$\frac{11}{30} + \frac{28}{A} = 1$$

$$\frac{28}{A} = \frac{19}{30}$$

Total number of days required to complete the whole work alone by $A = 44\frac{4}{19}$ days

34.   **(c)**

35.   **(a)**

$9 \times 9 \times 9 = 729$. So in each axis we get 9 pieces and for this 8 cuts are required in each axis. So minimum possible number of cuts required is $8 + 8 + 8 = 24$.

36.   **(b)**

Position of Gaurav from left is 16th and Rahul from left is 10th so there are $16 – 10 – 1 = 5$ persons sitting between Rahul and Nitesh. As Gaurav is sitting exactly in the middle between Rahul and Nitesh so 5 persons are sitting between Gaurav and Nitesh. Position of Gaurav from right = Position of Nitesh from right i.e. $9 + 5 + 1 = 9 + 6 = 15^{th}$.

Total number of persons = Sum of Gaurav's positions from both sides $– 1 = (16 + 15) – 1 = 31 – 1 = 30$

37.   **(d)**

$$\frac{\text{wine(left)}}{\text{water(added)}} = \frac{343}{169}$$

It means $\dfrac{\text{wine(left)}}{\text{wine(initial amount)}} = \dfrac{343}{512}$ ($\because 343 + 169 = 512$)

Thus, $343x = 512x\left(1 - \dfrac{15}{K}\right)^3$

$\Rightarrow$ $\dfrac{343}{512} = \left(\dfrac{7}{8}\right)^3 = \left(1 - \dfrac{15}{K}\right)^3$

$\Rightarrow$ $\left(1 - \dfrac{15}{K}\right) = \dfrac{7}{8} = \left(1 - \dfrac{1}{8}\right)$

$\Rightarrow$ $K = 120$

Thus the initial amount of wine was 120 litres.

39.   (a)

We know that,

$$UCL = \bar{\bar{x}} + A_2 \bar{R}$$

$$LCL = \bar{\bar{x}} - A_2 \bar{R}$$

$$\bar{R} = \frac{\Sigma R}{25} = \frac{370}{25} = 14.8$$

$$\bar{\bar{x}} = \frac{\Sigma \bar{x}}{25} = \frac{2500}{25} = 100$$

where $A_2 = 0.73$

$A_2 \bar{R} = 10.8$

So, $UCL = 100 + 10.8 = 110.8$

$LCL = 100 - 10.8 = 89.2$

40.   (d)

R_s = (Probability of first component working) + (Probability of second component working × Probability of needing second component i.e. first component not working)

$$= 0.8 + [0.8 \times (1 - 0.8)]$$

$$= 0.8 + 0.16 = 0.96$$

41.   (b)

Kanban is one method to achieve JIT. JIT stands for just in time, which says that material are only provided when there is demand. It is a physical control system consisting of card and container.

42.   (a)

$$\text{Failure rate } FR(N) = \frac{\text{Number of failures}}{\text{Number of unit-hours of operation time}}$$

$$\text{Total time} = 1000 \text{ hr} \times 20 \text{ units}$$

$$= 20000 \text{ unit-hour}$$

$$\text{Non-operating time} = 800 \text{ hr of 1}^{st} \text{ failure} + 200 \text{ hr for 2}^{nd} \text{ failure}$$

$$= 1000 \text{ unit-hour}$$

$$\text{Operating time} = \text{Total time} - \text{Non operating time}$$

$$= 20000 - 1000 = 19000 \text{ unit-hour}$$

$$\text{Failure rate } FR = \frac{2}{19000} = 0.105 \times 10^{-3} \text{ failure/unit-hours}$$

43. **(c)**

It provides guidance on auditing management systems, including the principles of auditing, managing an audit programmes and concluding management system audits. It also provides guidance on the evaluation of competence of individuals involved in the audit process including person managing the audit programme, auditors and audit term. It is applicable to all organisations that need to conduct internal or external audits of management systems or manage an audit programme.

44. **(b)**
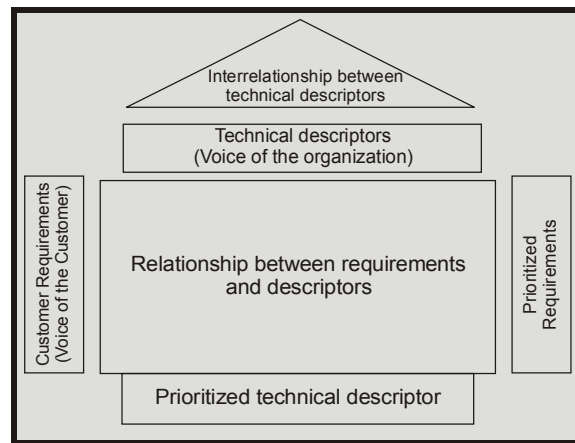
House of Quality:

Figure: House of Quality

- The outside walls of the house are shown as the customer requirements and their priorities. On the left side is a listing of voice of customer. On the right side is the prioritized customer requirement, which is derived from customer survey. The ceilings of the house contain the technical descriptors or requirements with expert's priorities. The central or interior walls of the house are the relationships between customer requirements and technical requirements. Customer voices (customer requirements) are translated into engineering requirements (technical descriptors). The roof of the house is the interrelationship between independent technical requirements. Here the trade-offs between similar and/or conflicting technical requirements are identified. The aim of the house is to determine prioritized technical requirements.

45. **(b)**

- System of Air Quality and Weather Forecasting and Research (SAFAR) was developed indigenously by Indian Institute of Tropical Meteorology (IITM), Pune and operationalized by the Indian Meteorological Department (IMD). It monitors all weather parameters like temperature, rainfall, humidity, wind speed and wind direction.
- It also measures UV-Index (UVI), PM, Mercury and Black carbon in real time in addition to regular air quality and weather parameters like PM2.5, PM10, Sulfur Dioxide, Ozone, Nitrogen Oxides, Carbon Monoxide, Methane, etc. The system also monitors the Benzene, Toluene and Xylene.

46. **(c)**

In humid tropical and equatorial climate, bacterial growth and action are intense and dead vegetation is rapidly oxidised leaving very low humus content in the soil. Further, bacteria and other soil organisms take gaseous nitrogen from the air and convert it into a chemical form that can be used by plants. This process is known as nitrogen fixation.

47. **(c)**

The pyramid of energy reflects the laws of thermodynamics, with conversion of solar energy to chemical energy and heat energy at each trophic level and with loss of energy being depicted at each transfer to another trophic level. Hence the pyramid of energy is always upward, with a large energy base at the bottom.

49. **(b)**

Bioleaching (or biomining) is a process in mining and biohydrometallurgy (natural processes of interactions between microbes and minerals) that extracts valuable metals from a low-grade ore with the help of microorganisms such as bacteria or archaea.

50. **(d)**

The cost of renewable energy normally stands higher than conventional sources due to high fixed cost of installation.

51. **(c)**

- Ecotone is a zone of junction between two or more diverse ecosystems. For e.g. the mangrove forest represents an ecotone between marine and terrestrial ecosystem.
- A well-developed ecotone may contain some organisms which are entirely different from that of the adjoining communities.

52. **(a)**

- EPCA was constituted with the objective of protecting and improving the quality of the environment and controlling environmental pollution in the National Capital Region (NCR).
- It was notified in 1998 by Ministry of Environment, Forests and Climate Change (MoEFCC) under Environment (Protection) Act, 1986.

Functions:

- To protect and improve the quality of environment and prevent and control environmental pollution in the National Capital Region.
- To enforce Graded Response Action Plan (GRAP) in NCR as per the pollution levels.

53. **(d)**

- Coal gasification is done using a mixture of coal, water, air and/or oxygen.
- Coal gas or Syngas is a mixture consisting primarily of Carbon Monoxide (CO), Hydrogen (H_2), Carbon Dioxide (CO_2), Methane (CH_4), and little amount of Water Vapour (H_2O).

55. **(a)**

Project sponsor is responsible of raising funds for project.

56. **(c)**

$$\text{CPI} \; = \; \frac{BCWP}{ACWP} \; = \; \frac{1200}{1300} = 0.92$$

57. **(b)**

The sole purpose of dummy activities is to establish logic in the network. It does not consume any resource or time.

59. **(a)**

Bar charts are useful for simple project. It does identify start and end dates of a schedule. It does not show inter dependencies which is a major disadvantage of bar chart.
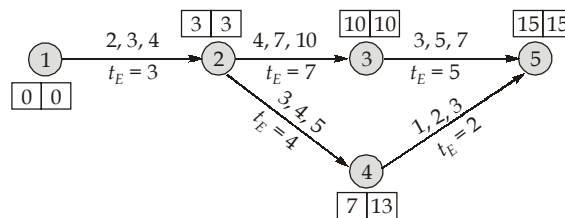
60. **(c)**

In design phase, technical parameters are frozen and basic designing is completed. In conception phase feasibility of project is assessed. The cost of change is maximum in commissioning phase.

61. **(c)**
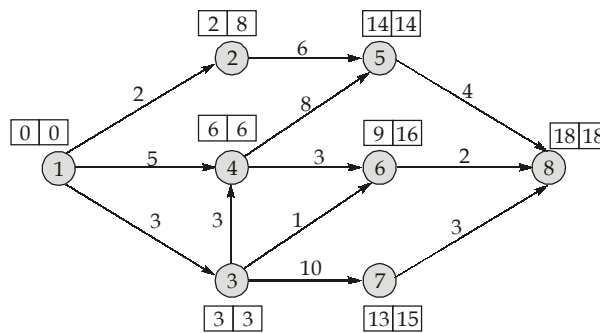
Critical path = 1 – 3 – 4 – 5 – 8

62. **(c)**

Critical path = 1 – 2 – 3 – 5

$$\sigma_{1-2} \; = \; \frac{4-2}{6} = 0.33$$

$$\sigma_{2-3} \; = \; \frac{10-4}{6} = 1$$

$$\sigma_{3-5} \; = \; \frac{7-3}{6} = 0.67$$

$$\sigma_{\text{total}} \; = \; \sqrt{\sigma_{1-2}^2 + \sigma_{2-3}^2 + \sigma_{3-5}^2} \; = \; \sqrt{0.33^2 + 1^2 + 0.67^2} \; = 1.25$$

63. **(b)**

Transverse bending test is most frequently employed for brittle ceramics in which a rod specimen having either a circular or rectangular cross-section is bent until fracture using three or four-point loading technique.

64. **(a)**

- In spite of having high strength, GFRP are not very stiff and do not display the rigidity that is necessary for some applications.
- Most fiberglass materials are limited to service temperatures below 200°C; at higher temperature, most polymers begin to flow. Service temperatures may be extended to approximately 300°C by using high purity fused silica for the fibers and high temperature polymers such as polyimide resins.

65. **(a)**

Most hybrid automobiles depend on lanthanum anode in their batteries.

66. **(c)**

Gold has FCC crystal structure.

For FCC crystal structure, $\sqrt{2}a = 4r$

$$a = \frac{4r}{\sqrt{2}}$$

∴   Volume, $a^3 = \left(\dfrac{4r}{\sqrt{2}}\right)^3$

67. **(d)**

Screw dislocations has its dislocation line parallel to Burger's vector. A screw dislocation is like a spiral ramp with an imperfection line down its axis.

68. **(c)**

- Covalent bonds are very strong and directional in nature.
- Ionic and metallic bonding are non-directional in nature.

69. **(d)**

Adding a small amount of magnesium and/or cerium to gray iron before casting produces nodular or ductile cast iron. In nodular cast iron, graphite still forms but as nodules or sphere like particles instead of flakes.

70. **(c)**

The density of electrons in the conduction band, density of holes in the valence band increases exponentially with increase in temperature.

71. **(b)**

Silicon has low fracture toughness.

72. **(a)**

$$B_o = \mu_o H$$

$$H = \frac{B_o}{\mu_o} = \frac{1.7 \times 10^{-5}}{4\pi \times 10^{-7}} = 13.5 \text{ A/m}$$

73. **(d)**

Retentivity: The measure of the magnetic flux density remaining in the material when the magnetizing field is removed.

Coercivity: Measure of the magnetic field strength required to destroy the residual magnetism in the material.

77. **(c)**

It is an integrated set of programme that controls the resource, memory and many types of I/O device of computer system and provides the user with it interface or virtual machine.

78. **(c)**

The Blue Ray Discs use Blue laser to transfer data on the device. They are made up of plastic as its base and they can store up to 50 GB of data.

82. **(a)**

Assessment, awareness, integration and evaluation are key components of Value-based ethics.

84. **(c)**

*   A value is affective disposition towards a person, object or idea.
*   Values are mental constructs and not social constructs.
*   A value is something we recognise as good, worthwhile and desirable.

87. **(b)**

Human or engineers' actions are role specific and all actions take place in a specific context or situation. An engineer's professional actions should not be based on financial interests or remuneration-specific. Lastly, all human actions reflect some value or other, therefore actions cannot be value free.

90. **(c)**

Duties are offered unconditionally. They tend to be promissory and open-ended, such as general duty owing to humanity.

91. **(c)**

People derive influence from their authority and interpersonal power.

92. **(c)**

UPI 2.0 was launched by Nation Payment Corporation of India (NPCI).

93. **(c)**

GSM technology was introduced prior to the 3G technology.

94.   **(c)**

Corrosion resistance of zirconium is very high even in the host of corrosive media including superheated water.

95.   **(d)**

Hard magnetic materials are used for making permanent magnets. These materials retain their magnetism even after the removal of the applied magnetic field. Hence these materials are used for making permanent magnets and soft magnetic materials are easy to magnetize and demagnetize.

96.   **(b)**

When the temperature of a metal increases, its electron mobility decreases not because of its high electron concentration but because of the increased vibrations of the electrons in the metal.

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