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ESE 2020 : Prelims Exam
CLASSROOM TEST SERIES

GENERAL STUDIES & ENGINEERING APTITUDE

Answer Key & Solutions of
Test No. 19

Full Syllabus Test 3

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

DETAILED EXPLANATIONS

1. (b)

The General Agreement on Tariffs and Trade (GATT) covers international trade in goods. The workings of the GATT agreement are the responsibility of the Council for Trade in Goods (Goods Council) which is made up of representatives from all WTO member countries.

2. (a)

- The Special Drawing Rights (SDR) is an international reserve asset, created by the International Monetary Fund (IMF) in 1969 to supplement its member countries' official reserves.
- The SDR serves as the unit of account of the IMF and some other international organizations.
- The SDR is neither a currency nor a claim on the IMF. Rather, it is a potential claim on the freely usable currencies of IMF members. SDRs can be exchanged for these currencies. It is also known as 'Paper Gold'.

3. (b)

The Phillips curve shows the relationship between unemployment and inflation in an economy.

4. (a)

- Pradhan Mantri JI-VAN (Jaiv Indhan-Vatavaran Anukool fasal awashesh Nivaran) Yojana aims to provide financial support to Integrated Bioethanol Projects using lignocellulosic biomass and other renewable feedstock. The scheme focuses to incentivise 2G Ethanol (Bio-fuel) sector and support this nascent industry by creating a suitable ecosystem for setting up commercial projects and increasing Research & Development in this area.
- The JI-VAN Yojana will be supported with total financial outlay of Rs.1969.50 crore for the period from 2018-19 to 2023-24.
- Ministry of Petroleum & Natural Gas has targeted to achieve 10% blending percentage of Ethanol in petrol by 2022. It is nodal agency to implement the scheme.

6. (d)

- The Mekong-Ganga Cooperation (MGC) is an initiative by six countries - India and five ASEAN countries, namely, Cambodia, Laos (Officially Lao PDR), Myanmar, Thailand and Vietnam for cooperation in tourism, culture, education, as well as transport and communications.
- Though Mekong river originates from China, it is not a member of Mekong-Ganga Cooperation (MGC).

8. (a)

The characteristic equation is $|A - \lambda I| = 0$

i.e. $$\begin{vmatrix} 5-\lambda & 4 \\ 1 & 2-\lambda \end{vmatrix} = 0$$

$$\lambda^2 - 7\lambda + 6 = 0$$

$\therefore$ $$\lambda = 6, 1$$

If x, y be the components of an Eigen vector corresponding to the Eigen value λ,

$$[A - \lambda I]X = \begin{bmatrix} 5-\lambda & 4 \\ 1 & 2-\lambda \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = 0$$

Corresponding to $\lambda = 6$, we have $\begin{bmatrix} -1 & 4 \\ 1 & -4 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = 0$

Which gives only one independent equation

$$-x + 4y = 0$$

$$\therefore \quad \frac{x}{4} = \frac{y}{1} \text{ giving the Eigen vector } \begin{bmatrix} 4 \\ 1 \end{bmatrix}.$$

Corresponding to $\lambda = 1$, we have

$$\begin{bmatrix} 4 & 4 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = 0$$

Which gives only one independent equation $x + y = 0$.

$$\therefore \quad \frac{x}{1} = \frac{y}{-1} \text{ giving the Eigen vector } \begin{bmatrix} 1 \\ -1 \end{bmatrix}.$$

9. (a)

Let

$$y = \lim_{x \to \frac{\pi}{2}} (\sin x)^{\tan x}$$

$$\therefore \quad \ln y = \lim_{x \to \frac{\pi}{2}} \tan x \ln \sin x$$

$$= \lim_{x \to \frac{\pi}{2}} \frac{\ln \sin x}{\cot x} = \lim_{x \to \frac{\pi}{2}} \frac{\left(\frac{1}{\sin x}\right)\cos x}{-\text{cosec}^2 x}$$

$$= -\lim_{x \to \frac{\pi}{2}} (\sin x \cos x) = 0$$

Hence, $y = e^0 = 1$

10. (b)

The table of x and corresponding values of $f(x)$ are as follows:

i	x_i	$y_i = x^4$
0	−2	$y_a = 16$
1	−1	$y_1 = 1$
2	0	$y_2 = 0$
3	1	$y_3 = 1$
4	2	$y_4 = 16$

Using Simpson rule, we have

$$\int_{-2}^{2} x^4 dx = \frac{h}{3}\left[y_0 + 4(y_1 + y_3) + 2(y_2) + y_4\right]$$

$$= \frac{1}{3}[16+4(2)+2(0)+16]$$

$$= \frac{40}{3} = 13.33$$

11. (d)

Here $z_o = \ln 2 = 0.69315$ lies inside the square

$$I = \oint_c e^{3z}\frac{dz}{(z-\ln 2)^{3+1}}$$

$$= \frac{2\pi i}{3!}\frac{d^3}{dz^3}e^{3z}\Big|_{z=\ln 2}$$

$$= \frac{\pi i}{3}27e^{3z}\Big|_{z=\ln 2}$$

$$= 9\pi i\, e^{3\ln 2} = 72\pi i$$

12. (c)

Two boys are to be selected out of 5 boys. A particular boy A is to be included in the committee. It means that only 1 boy is to be selected out of 4 boys.

Number of ways of selection $= {}^4C_1$

Similarly, a girl B is to be included in the committee.

Then only 3 girls are to be selected out of 5 girls.

Number of ways of selection $= {}^5C_3$

$$\text{Required probability} = \frac{{}^4C_1 \times {}^5C_3}{{}^5C_2 \times {}^6C_4} = \frac{4\times 10}{10\times 15} = \frac{4}{15}$$

13. (b)

$$p = \frac{40}{600} = \frac{1}{15}$$

$$n = 10,\ m = np = 10\times\frac{1}{15} = \frac{2}{3}$$

$$P(r) = \frac{e^{-m}\cdot m^r}{r!} = \frac{e^{\frac{-2}{3}}\left(\frac{2}{3}\right)^r}{r!}$$

$$P(o) = \frac{e^{-2/3}\left(\frac{2}{3}\right)^0}{0!} = e^{-2/3}$$

14. (c)

$$\text{Inverse Laplace of } \frac{1}{s} = 1$$

and $$L^{-1}\left[\frac{1}{(s^2+a^2)}\right] = \frac{\sin at}{a}$$

Hence by the convolution theorem.

$$L\left[\int_0^t 1\frac{\sin a(t-x)}{a}dx\right] = \left(\frac{1}{s}\right)\left(\frac{1}{s^2+a^2}\right)$$

$$L^{-1}\left[\frac{1}{s(s^2+a^2)}\right] = \int_0^t 1\frac{\sin a(t-x)}{a}dx$$

$$= \left[\frac{-\cos(at-ax)}{-a^2}\right]_0^t = \frac{1}{a^2}[1-\cos at]$$

15. (c)

The characteristic equation is : $m^2 + am + b = 0$. For solution to be of the form $y = (c_1 + c_2x)\, e^{mx}$, the roots of characteristic equation are real and equal,

$$\text{The roots are } m = \frac{-a \pm \sqrt{a^2-4b}}{2}$$

For the roots to be equal, $a^2 - 4b = 0$

$\therefore$ $$a^2 = 4b$$

16. (a)

$$I = \int_0^{2\pi}\int_0^{\frac{\pi}{3}}\int_0^2 r^2 \sin\phi \; dr \; d\phi d\theta$$

$$I = \int_0^{2\pi}\int_0^{\frac{\pi}{3}}\left[\frac{r^3}{3}\right]_0^2 \sin\phi d\phi d\theta = \int_0^{2\pi}\int_0^{\frac{\pi}{3}}\frac{8}{3}\sin\phi\, d\phi\; d\theta$$

$$= \int_0^{2\pi}\frac{8}{3}[-\cos\phi]_0^{\pi/3}\, d\theta$$

$$= \int_0^{2\pi}\frac{8}{3}[-(0.5-1)]d\theta = \frac{8}{6}\int_0^{2\pi} d\theta = \frac{8}{6}(2\pi-0) = \frac{8\pi}{3}$$

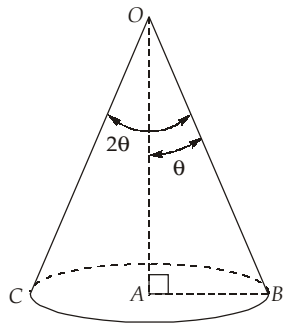
17. (c)

Divergence of curl of $\vec{a}$ is zero.

i.e. $$\nabla\cdot(\nabla\times\vec{a}) = 0$$

18. (d)

The maximum angle between the generators of cone is,



$$\text{Apex angle } (2\theta) = \frac{\pi}{2} = 90°$$

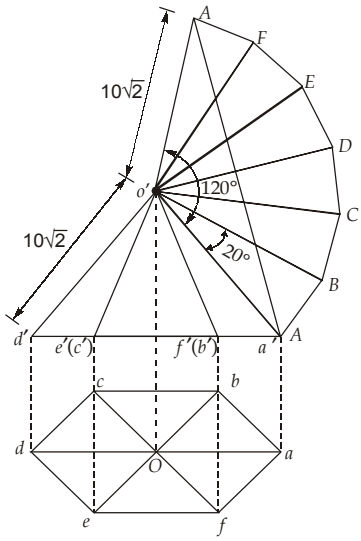
$\because$ In ΔOAB,

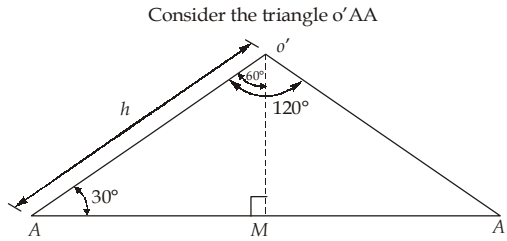
$$\Rightarrow \quad \tan\theta = \frac{AB}{OA} = \frac{d/2}{h}$$

$$\Rightarrow \quad d = 2h\tan\theta = 2 \times 5 \times \tan 45° = 10 \text{ cm}$$

19. (c)

In the developed surface of the pyramid, "AA" distance is the required shortest length of thread wrapped around the pyramid.





$$AA = ?$$

$$AA = 2AM$$

$$h^2 = (AM)^2 + (OM)^2$$

since, $\quad \tan 60° = \dfrac{AM}{OM}$

So, $\quad OM = \dfrac{AM}{\sqrt{3}}$

$$(10\sqrt{2})^2 = (AM)^2 + \left(\frac{AM}{\sqrt{3}}\right)^2$$

$$200 = \frac{4(AM)^2}{3}$$

$$AM^2 = \frac{600}{4}$$

$$AM = \sqrt{\frac{600}{4}} = 5\sqrt{6}$$

Since, $AA = 2AM$

Finally $AA = 2\left(5\sqrt{6}\right)$

$$AA = 10\sqrt{6} \text{ cm}$$

Alternate-1:

$$\frac{AA}{\sin 120^\circ} = \frac{OA}{\sin 30^\circ}$$

$$AA = OA \times \frac{\sin 120^\circ}{\sin 30^\circ}$$

but $\sin 120^\circ = \sin(90^\circ + 30^\circ) = \cos 30^\circ = \frac{\sqrt{3}}{2}$

Hence, $AA = 10\sqrt{2} \times \frac{\left(\sqrt{3}/2\right)}{(1/2)} = 10\sqrt{6}$ cm

Alternate-2:

$$AA = 2AM$$
$$= 2 \times OA\cos 30^\circ$$
$$= 2 \times 10\sqrt{2} \times \frac{\sqrt{3}}{2} = 10\sqrt{6} \text{ cm}$$

20. (c)

There are 3 methods of drawing ellipse in AutoCAD.

1. Center method
2. Axis, end method
3. Elliptical arc method

Three point method is used to create an arc using three points.

21. (b)

From comparison matrix gives relative cost,

Cost of cast iron = 4 times cost of steels

So, Cost of steel = $\frac{1}{4}$ times of cost of cast iron

So, Variable, $X = \frac{1}{4}$

22. (a)

Fire Brigade's Responsibilities:

- Supervise department fire drills and exercises when a member is on vacation.
- Provide emergency scene first aid, Cardiopulmonary resuscitation (CPR) and Automated External Defibrillators (AED) if necessary.
- Operate fire fighting equipment (e.g. ladders, hoses, extinguishers).
- Conduct inspections of particular departments.
- Implement emergency shutdown procedures.

23. (b)

Let x and y be the two non-negative integers

Since $x + y = 200$

$$\therefore \quad (xy)_{max} = 100 \times 100 = 10000 \quad (xy_{max} \text{ at } x = y)$$

Now, $$xy \not< \frac{3}{4} \times 10000$$

$$\Rightarrow \quad xy \geq \frac{3}{4} \times 10000$$

$$\Rightarrow \quad xy \geq 7500$$

$$\Rightarrow \quad x(200 - x) \geq 7500$$

$$\Rightarrow \quad x^2 - 200x + 7500 \leq 0$$

$$\Rightarrow \quad 50 \leq x \leq 150$$

So favourable number of ways = 150 – 50 + 1 = 101

Total number of ways = 200

Hence, required probability = $\frac{101}{200}$

24. (a)

There are 5 even digits viz., 0, 2, 4, 6 and 8. Digit 3 cannot be at the tens place, since if 3 is at tens place, then 9 must be at unit place which is impossible. Hence 3 can be only at hundred's place. Now there are two cases:

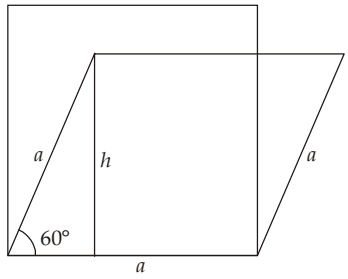
1. **When 3 is at hundred's place**: If 3 is at hundred's place, then 9 will be at ten's place. So unit place can be filled up in only 5 ways by using even digits.
   So, the total number of even numbers = 1 × 1 × 5 = 5.
2. **When 3 is not at hundred's place**: In this case hundred's place can be filled up in 8 ways (0 and 3 can not be used). In tens place we can use any one of the 10 digits except 3. So tens place can be filled up in 9 ways and unit place can be filled up in 5 ways by using 0, 2, 4, 6 and 8.

So, the total number of even numbers = 8 × 9 × 5 = 360

Hence the total number of required 3 digits even numbers

= 5 + 360 = 365

25. (a)



$$\frac{h}{a} = \sin 60°$$

$$\frac{h}{a} = \frac{\sqrt{3}}{2}$$

$$\Rightarrow \quad h = \frac{a\sqrt{3}}{2}$$

$$\therefore \quad \text{Area of rhombus} = a \times h = \frac{a \times \sqrt{3}a}{2}$$

and $\quad \text{Area of square} = a^2$

$$\therefore \quad \text{Required ratio} = \frac{a^2}{\sqrt{3}a^2} \times 2 = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$$

26. (b)

A's share = Rs. 250

B's share = Rs. 100

It means the ratio of efficiency of $A : B = 250 : 100 = 5 : 2$

$\therefore$ Ratio of days taken by A and B $= 2x : 5x$

Now, $5x - 2x = 9 \Rightarrow x = 3$

$\therefore$ Number of days taken by A = 6 (Efficiency = 16.66%)

Number of days taken by B = 15 (Efficiency = 6.66%)

Therefore, number of days taken by A and B, working together

$$= \frac{100}{23.33} = \frac{300}{70} = 4\frac{2}{7} \text{ days}$$

27. (c)

$$\angle ABD = \angle ABC - \angle DBC$$
$$= \angle ABC - \angle BDC$$
$$= \angle ABC - (\angle ABD + \angle BAD)$$

$\therefore \quad 2(\angle ABD) = \angle ABC - \angle BAD = 30°$

$\therefore \quad \angle ABD = 15° \quad (\because \angle BAD = \angle BAC)$

28. (c)

Let there be x pencils and y pens, then

$\therefore \quad x + y = 40$

$\Rightarrow \quad 4x + 4y = 160 \quad \ldots$ (i)

$(x + 5) = 4(y - 5)$

$\Rightarrow \quad x - 4y = -25 \quad \ldots$ (ii)

Using equation (i) and (ii), we get

$5x = 135$

$\Rightarrow \quad x = 27$

$\therefore \quad y = 13$

29. (d)

Put $x = -1$, then,

$$(-1)^3 + a(-1)^2 - b(-1) - 6 = 0$$

or $$-1 + a + b - 6 = 0$$

or $$a + b - 7 = 0 \quad \text{... (i)}$$

Put $x = 2$, then,

$$(2)^3 + a(2)^2 - b(2) - 6 = 0$$

or $$8 + 4a - 2b - 6 = 0$$

or $$4a - 2b + 2 = 0 \quad \text{... (ii)}$$

By solving equation (i) and (ii)

$$a + b - 7 = 0 \Rightarrow a + b = 7$$

and $$4a - 2b + 2 = 0 \Rightarrow 2a - b = -1$$

$\therefore$ $$3a = 6$$

$\Rightarrow$ $$a = 2$$

Substituting $a = 2$ in equation (i) we get $b = 5$

$\therefore$ $a = 2$ and $b = 5$

30. (d)

$$2|x|^2 - 5|x| + 2 = 0$$

$\Rightarrow$ $$(2|x| - 1)(|x| - 2) = 0$$

$\therefore$ $$|x| = \frac{1}{2}, 2$$

$\therefore$ $$x = \pm\frac{1}{2}, \pm 2$$

31. (d)

Total runs scored = $(36 \times 5) = 180$.

Let the runs scored by E be x.

Then, Runs scored by D = $x + 5$;

Runs scored by A = $x + 8$;

Runs scored by B = $x + x + 5 = 2x + 5$;

Runs scored by C = $(107 - B) = 107 - (2x + 5) = 102 - 2x$.

So, Total runs = $(x + 8) + (2x + 5) + (102 - 2x) + (x + 5) + x = 3x + 120$.

Therefore $$3x + 120 = 180$$

$\Rightarrow$ $$3x = 60$$

$\Rightarrow$ $$x = 20$$

32. (b)

Time from 7 a.m. to 4.15 p.m. = 9 hrs 15 min. = $\frac{37}{4}$ hrs.

3 min. 5 sec. of this clock = 3 min. of the correct clock.

$\Rightarrow$ $\frac{37}{720}$ hrs. of this clock = $\frac{1}{20}$ hrs of the correct clock.

$\Rightarrow$ $\frac{37}{4}$ hrs of this clock = $\left(\frac{1}{20}\times\frac{720}{37}\times\frac{37}{4}\right)$ hrs of the correct clock.

= 9 hrs of the correct clock.

$\therefore$ The correct time is 9 hrs after 7 a.m. i.e., 4 p.m.

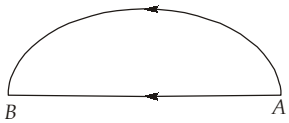
33. (b)

$(7 \times 3) = 21$ and $(9 \times 3) = 27$

and $(4 \times 9) = 36$ and $(2 \times 9) = 18$

Therefore, $(9 \times 6) = 54$ and $(4 \times 6) = 24$.

34. (d)



Let the radius be r, then difference in the distance

$= (\pi r - 2r) = r(\pi - 2)$

$= r\left(\frac{22}{7} - 2\right) = 60\times 3$

$\Rightarrow$ $2r = 315$ m

35. (c)

In FNSD analysis,

F : Fast moving items

N : Normal moving items

S : Slow moving items

D : Dead stock

36. (a)

Genichi Taguchi has provided us three concepts aimed at improving both product and process quality:

- Quality robustness
- Quality loss function
- Target-Oriented quality

37. (d)

5-s is a philosophy and a way of organizing and managing the workspace and workflow with the intent to improve efficiency by eliminating waste. It helps to have a basis of strong management of workplace.

38. (d)

The given data is for control chart and C chart is based on the Poisson probability distribution. The standard deviation for Poisson distribution is the square root of the mean

$$\text{Mean, } \bar{C} = \frac{C_1 + C_2 + C_3 + C_4 + C_5}{5} = \frac{3+2+2+4+4}{5} = \frac{15}{5} = 3$$

$$\text{Standard deviation, } s = \sqrt{\bar{C}} = \sqrt{3} = 1.73$$

39. (c)

Yellow light indicates minor problem and red light indicates stoppage of production.

40. (d)

- Price often has a large influence on expectation. Higher the prices, higher are customer expectation.
- Alternative services available also help define and set expectations.
- Marketing can have a considerable influence on expectations. Marketing, branding and advertising campaigns help set expectations.
- Word-of-mouth marketing can have a profound effect on customer expectations. Indeed, in some situations, word-of-mouth may have a stronger influence than organizational marketing.
- Customers' mood and attitude can affect the expectations. Someone in a bad mood or with a poor attitude to an organization may have heightened expectations; someone less concerned and more tolerant may have a wider zone of tolerance and thus has a wider range of expectations.

42. (c)

When the six-sigma concept was initially developed, an assumption was made that when the process reached the six-sigma quality level, the process mean was still subjected to disturbances that could cause it to shift by as much as 1.5 standard deviations off target. Under this scenario, a six-sigma process would produce about 3.4 ppm defects.

44. (a)

- Bioaugmentation is the practice of adding cultured microorganisms into the subsurface for the purpose of biodegrading contaminants. It is commonly used in municipal wastewater treatment to restart activated sludge bioreactors.

45. (c)

Emissions from Petrol Vehicles

- Emissions from petrol cars have been dramatically reduced by the introduction of catalytic converters, which oxidise pollutants such as CO to less harmful gases such as CO_2. When compared to petrol cars without catalysts, catalyst cars have much lower CO, HC and NO_x emissions, at the expense of CO_2 emissions, which increase due to the oxidation of carbon monoxide to CO_2.
- As a consequence of this, a catalyst car will also use slightly more fuel and become less efficient. However, despite these improvements, petrol cars with catalysts still produce more CO and HC than diesel cars, although exhaust emissions of NO_x and particulates are much lower than diesel cars. In fact particulate emissions from petrol cars are so low that they are not routinely measured.

Emissions from Diesel Vehicles

- Diesel fuel contains more energy per litre than petrol and coupled with the fact that diesel engines are more efficient than petrol engines, diesel cars are more efficient to run. Diesel fuel contains no lead and emissions of the regulated pollutants (carbon monoxide, hydrocarbons and nitrogen oxides) are lower than those from petrol cars without a catalyst. However, when compared to petrol cars with a catalyst, diesels have higher emissions of NOx and much higher emissions of particulate matter.
- Emissions from diesel vehicles, especially particulate matter and black carbon, are the major reasons for air pollution as well. Sulphates, like sulphur dioxide, released in the atmosphere may lead to acid rain.

46. (d)

- The International Renewable Energy Agency (IRENA) is an intergovernmental organization that supports countries in their transition to a sustainable energy future, and serves as the principal platform for international cooperation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy.
- IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy.
- India has recently seen an expansion in solar photovoltaic employment, while China, the US, Japan and the European Union have seen a declining trend in this sector according to the International Renewable Energy Agency (IRENA).

47. (a)

- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted on 22 March 1989 by the Conference of Plenipotentiaries in Basel, Switzerland, in response to a public outcry following the discovery, in the 1980s, in Africa and other parts of the developing world of deposits of toxic wastes imported from abroad.
- The Convention entered into force in 1992. It is not legally binding on signatory countries. It provides technical guidelines for the foundation upon which countries can operate at a standard that is not less environmentally sound than that required by the Basel Convention.

48. (c)

The predominant vegetation of both hot and mid latitude deserts is Xerophytic or drought resistant scrub. This includes bulbous cacti, thorny bushes, long rooted wiry grasses and dwarf acacias. Along the Western Coastal desert, cold currents as in the Atacama Desert, the mist and fog formed by the chilling of the warm air over cold currents, roll in land and nourish a thin cover of vegetation.

50. (a)

- Photochemical smog occurs in a warm, dry and sunny climate. The main components of the photochemical smog results from the action of sunlight on unsaturated hydrocarbons and nitrogen oxides produced by automobiles and factories.
- Photochemical smog has a high concentration of oxidizing agents and is, therefore, also called oxidizing smog.

Effects of photochemical smog: The common components of photochemical smog are ozone, nitric oxide, acrolein, formaldehyde and peroxyacetyl nitrate (PAN).

51. (a)

Environmental Impact Assessment is defined as an activity that has been designed to identify, predict and interpret the impact of an action on human health, including the well-being of the ecosystem on which the survival of human beings depends.

The environmental clearance process for new projects consists of four stages, some of which may not be required for all projects. These four stages in sequential order are:

- Screening stage: The State level Expert Appraisal Committee (SEAC) reviews the application.
- Scoping stage: This is carried out by the Expert Appraisal Committee (EAC) for Category A projects and by the State-level Expert Appraisal Committee (SEAC) for Category B1 projects.
- Public Consultation stage: This stage involves consultation with project-affected persons on the effects of the project.
- Appraisal stage: This stage sees the overall and detailed scrutiny of the final EIA report, which will have been presented to EAC or SEAC.

52. (c)

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between Governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

CITES was drafted as a result of a resolution adopted in 1963 at a meeting of the members of IUCN.

CITES is an international agreement to which States and regional economic integration organizations adhere voluntarily. States that have agreed to be bound by the Convention (i.e. joined CITES) are known as Parties. Although, CITES is legally binding on the Parties.

53. (d)

- Researchers at Indian Institute of Technology (IIT) Madras have experimentally shown that methane and carbon dioxide (CO_2) can exist as gas hydrates at temperatures and pressures seen in interstellar atmosphere.
- Gas hydrates are formed when a gas such as methane gets trapped in well-defined cages of water molecules forming crystalline solids.
- Gas hydrate is a solid ice-like form of water that contains gas molecules (often Argon) in its molecular cavities.
- Natural gas hydrates occurs on continental margins and shelves worldwide from Polar Regions to the tropics.

54. (b)

Wildlife protection act came into effect in 1972. The primary purpose of enacting this was to maintain ecological processes and life-supporting systems to preserve biodiversity and to ensure continuous use of species i.e., protection and conservation of wildlife. The major provisions of this act are :

- Strengthening management and protection of infrastructure of National parks and sanctuaries.
- It prohibits hunting endangered species. It bans the trade or commerce only for scheduled animals.
- Special care and captive breeding programmes for highly endangered species (e.g. Gharial, Estuarine Crocodile) of wildlife.
- The Act defines the wildlife-related terminology and provides a comprehensive list of endangered wildlife species.
- Development of selected Ex-situ conservation areas, like Zoological Gardens and Botanical Gardens.

55. (d)

Tides are a result of gravitational pull by both Sun and Moon, but the pull exerted by Sun is apparently weak. This is because of the larger distance as the gravitational force is inversely proportional to the square of the distance. The alignment of the Sun and the moon affects the height of the tides.

56. (c)

- Ecological succession is a universal process of directional change in vegetation, on an ecological time scale. It occurs when a series of communities replace one another due to large scale destruction either natural or manmade. This process continues - one community replacing another community, until stable, mature community develops. It is a progressive series of changes which leads to the establishment of a relatively stable climax community.
- Succession is characterised by the following: increased productivity, the shift of nutrients from the reservoirs, increased diversity of organisms with increased niche development, and a gradual increase in the complexity of food webs.

57. (b)

Noncritical activities, do not demand special attention since there is a float time available to complete that activity.

58. (c)

$$\sigma = \frac{t_p - t_o}{6} = \frac{14-2}{6} = 2 \text{ days}$$

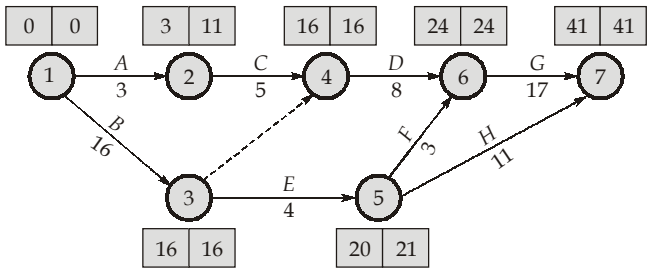
59. (d)

$$\text{Total float} = T_L^j - T_E^i - t_{ij}$$
$$= 26 - 4 - 7 = 15 \text{ days}$$

61. (b)

Planning process develops the best course of action to attain the stated scope of work and objectives.

62. (d)



1 - 3 - 4 - 6 - 7

64. (a)

$$d_{hkl} = \frac{a}{\sqrt{h^2+k^2+l^2}} = \frac{0.2866}{\sqrt{2^2+2^2+0}} = 0.1013 \text{ nm}$$

65. (c)

Tin bronze has composition (wt%) as 10% Sn, 2% Zn and rest is copper.

66. (c)

Advantages of hybrid bearing over conventional steel bearing:

1. Less weight
2. High modulus of elasticity
3. Less noise and vibrations
4. Longer life generally three to five times greater
5. Less heat is generated

67. (d)

Weak Van der Waals bond: The graphite structure is composed of layer of hexagonally arranged carbon atoms; within the layer, each carbon atom is bonded to three coplanar neighbour atoms by strong covalent bonds. The fourth bonding electrons participates in a weak van der Waals type of bond between the layer which makes it soft.

69. (a)

Material	Interaction between neighbouring dipoles
Paramagnetic	Negligible
Ferromagnetic	Parallel orientation
Antiferromagnetic	Anti parallel orientation of equal moments
Ferrimagnetic	Anti parallel orientation of unequal moments.

70. (b)

As we know that in a degenerated (extrinsic) semi-conductor the minority carrier are proportional to the temperature whereas majority carriers are almost independent of temperature. Thus, in an *n*-type semiconductor when temperature increases the concentration of minority carriers (holes) also increases and at a particular temperature called curie temperature, the concentration of minority carriers becomes equal to the concentration of majority carriers and semiconductor starts behaving like an intrinsic semiconductor.

71. (d)

Conductivity of intrinsic semiconductor increases with temperature.

73. (d)

Ductility is a measure of the degree of plastic deformation that has been sustained at fracture. In question, there is no information given about fracture, so we cannot predict about ductility of two materials.

74. (d)

The "Cyber Swachhta Kendra" (Botnet Cleaning and Malware Analysis Centre) is a part of the Government of India's Digital India initiative under the Ministry of Electronics and Information Technology (MeitY) to create a secure cyber space by detecting botnet infections in India and to notify, enable cleaning and securing systems of end users so as to prevent further infections. This centre is being operated by the Indian Computer Emergency Response Team (CERT-In).

75. (d)

DNA digital data storage is to store it the process of encoding and decoding binary data to and from synthesized strands of DNA. While DNA as a storage medium has enormous potential because of its high storage density, its practical use is currently severely limited because of its high cost and very slow read and write times.

79. (c)

Instead of omnidirectional antenna beams 5G will use highly directional beams.

81. (b)

It is bootlegging which referred as working on the projects which are prohibited or not properly authorized.

83. (c)

Moral Awareness: Proficiency in recognizing moral problems in engineering.
Cogent Moral Reasoning: Comprehending and assessing different views.
Moral Coherence: Forming consistent viewpoints based on facts.

89. (c)

- Green GDP is a term generally used for expressing GDP after adjusting for environmental damage. It monetizes the loss of biodiversity, and accounts for costs caused by climate change.
- The data collected for Green GDP is aggregated value and not precise.

90. **(b)**
In Rapid prototyping model time taking from details drawing to prototype is typically shorter than if the part was made in a model shop due to issues of scheduling and programming of machine tools.

91. **(c)**
Carbon di-oxide is the result of complete combustion which occurs when more oxygen present than the fire needs.

94. **(c)**
In pure product organization one individual maintains complete line of authority.

95. **(c)**
Unsaturated covalent bonding also known as metallic bonding comes in category of primary bonds.

97. **(c)**
When all the repeating units along a chain are of the same type, the resulting polymer is called a homopolymer.
Chains may be composed of two or more different repeat unit, in what are termed copolymers.

98. **(d)**
A software developer will likely rent a PaaS instead of SaaS.

100. **(c)**
- Conscience is internal factor that determine the morality of human action.
- Law lays down general guideline regarding human action whereas conscience determines practical rule for specific action. Therefore, conscience is different from law.

■■■■