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ESE 2025 : Prelims Exam | CLASSROOM TEST SERIES | GS & ENGINEERING APTITUDE | Test 7

Section A : Basics of Project Management

Section B : General Principles of Design, Drawing, Importance of Safety

Section C : Basics of Energy and Environment

ANSWER KEY

1.	(b)	**11.**	(d)	**21.**	(c)	**31.**	(c)	**41.**	(c)
2.	(a)	**12.**	(d)	**22.**	(d)	**32.**	(d)	**42.**	(c)
3.	(b)	**13.**	(b)	**23.**	(a)	**33.**	(a)	**43.**	(d)
4.	(c)	**14.**	(d)	**24.**	(d)	**34.**	(b)	**44.**	(a)
5.	(d)	**15.**	(b)	**25.**	(d)	**35.**	(b)	**45.**	(b)
6.	(a)	**16.**	(a)	**26.**	(b)	**36.**	(d)	**46.**	(b)
7.	(a)	**17.**	(a)	**27.**	(b)	**37.**	(a)	**47.**	(b)
8.	(c)	**18.**	(a)	**28.**	(b)	**38.**	(d)	**48.**	(d)
9.	(c)	**19.**	(d)	**29.**	(c)	**39.**	(a)	**49.**	(c)
10.	(b)	**20.**	(d)	**30.**	(b)	**40.**	(a)	**50.**	(b)

Section A : Basics of Project Management

1. (b)

The PMBOK defines a project.

"A temporary endeavour undertaken to create a unique product or service". Temporary means that every project has a definite end. Unique means that the product or service is different in some distinguishing way from all similar product or services.

2. (a)

The project management process groups that provide a structured approach to project management. Five key project management processes order:

1. Initiating process group.
2. Planning process group.
3. Execution process group.
4. Monitoring and controlling process group.
5. Closing process group.

This sequence is critical because it establishes a logical flow, starting with formal authorization and planning, moving through execution and monitoring with project closure.

3. (b)

$$\text{Break even point (units)} = \frac{\text{Fixed cost}}{\text{Selling price per unit} - \text{Variable cost per unit}}$$

$$= \frac{60000}{25 - 10} = 4000 \text{ units}$$

4. (c)

- Risk acceptance does not mean no action or no effect.
- Risk transfer is not always the best strategy.

5. (d)

Using the capital asset pricing model (CAPM).

$$\text{Cost of equity} = R_f + \beta(R_m - R_f)$$

where,

R_f = Risk free rate = 4%

β = Beta of the company = 1.2

R_m = Expected market return = 10%

Therefore, $\text{Cost of equity} = 4\% + 1.2(10\% - 4\%)$

$= 11.2\%$

6. (a)

The future value (FV)/Maturity value (MV) is calculated

$$\text{MV} = P\left[\frac{(1+r)^n - 1}{r}\right]$$

where,

P = Annual cash flow = ₹10,000

r = Annual interest rate = 8% = 0.08

$$n = 5 \text{ years}$$

$$\text{Maturity value} = 10000\left[\frac{(1+0.08)^5 - 1}{0.08}\right] = 10000\left[\frac{1.469 - 1}{0.08}\right]$$

$$= 58666$$

7. (a)

8. (c)

- WBS is a hierarchical decomposition of project tasks that helps define deliverables and allocate resources effectively.
- The main job are broken down into number of small manageable units depending upon size, time or efforts required for completion.

9. (c)

10. (b)

$$\text{Variance formula, } \sigma^2 = \left(\frac{t_p - t_o}{6}\right)^2$$

The variance for each contractor in calculated as :

Contractor P : $\sigma_P^2 = \left(\frac{10-5}{6}\right)^2 = 0.69$

Contractor Q : $\sigma_Q^2 = \left(\frac{13-10}{6}\right)^2 = 0.25$

Contractor R : $\sigma_R^2 = \left(\frac{36-9}{6}\right)^2 = 20.25$

Contractor S : $\sigma_S^2 = \left(\frac{35-3}{6}\right)^2 = 28.44$

Lower variance means higher certainty in completing the project.

$$\sigma_S^2 > \sigma_R^2 > \sigma_Q^2 > \sigma_P^2$$

Contractor Q has the lowest variance (0.25) making them most certain.

11. (d)

The crash cost per day for each activity is calculated as :

$$\text{Crash cost per day} = \frac{\text{Crash cost – Normal cost}}{\text{Normal time – Crash time}}$$

For Activity A: $\frac{3200 - 2000}{8 - 5} = \frac{1200}{3} = ₹400$

For Activity B: $\frac{2100 - 1500}{6 - 4} = \frac{600}{2} = ₹300$

For Activity C: $\frac{4200 - 3000}{10 - 7} = \frac{1200}{3} = ₹400$

For Activity D: $\dfrac{1800-1200}{5-3} = \dfrac{600}{2} = ₹300$

- The cheapest activity to crash is the one with the lowest crash cost per day.
- Activity B and Activity D both have the lowest crash cost/day (₹300).

$\because$ D is a critical activity.

Therefore, activity D crashed first.

12. (d)

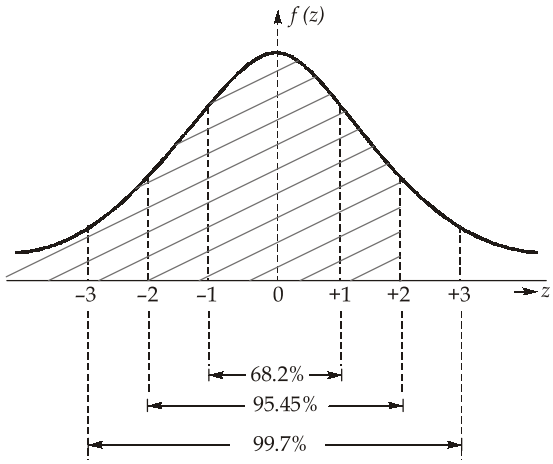
$$\text{Probability factor, } z = \frac{x - t_e}{\sigma}$$

where, t_e = expected completion time = 50 days

σ = standard deviation of project = 5 days

x = 60 days

$\therefore$ $$z = \frac{60-50}{5} = +2$$



$$\text{Probability of completion, } P = 50\% + \frac{95.45\%}{2} = 97.72\%$$

13. (b)

During the initiation phase, the feasibility of the project is evaluated; stakeholders are identified, and project objectives are defined. Planning details and task assignments occur later in the planning and execution phases.

14. (d)

15. (b)

- Dummy is a type of operation which neither requires time nor any resource, but it denotes dependency among the activities.
- It is represented by dashed arrow.
- Dummy is used to serve following purpose:
  1. Grammatical purpose.
  2. Logical purpose.

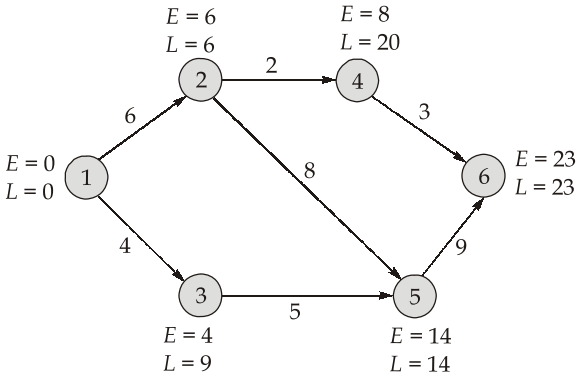
16. (a)

$$\text{CPI} = \frac{\text{Earned value}}{\text{Actual value}}$$

CPI is a key performance indicator in project management that measures the cost efficiency of a project.

- CPI > 1 → Project is under budget (efficient cost usage)
- CPI = 1 → Project is on budget
- CPI < 1 → Project is over budget (inefficient cost usage)

17. (a)



$$(FF)_{2\text{-}4} = (8 - 6) - 2 = 0$$

18. (a)

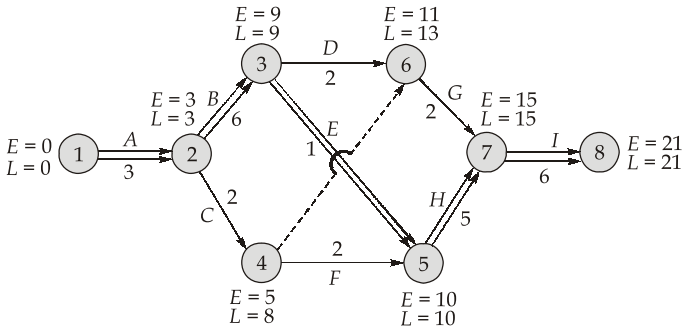
The primary purpose of project monitoring and control is to track project progress against the base line, identify deviations and implement corrective or preventive measures to ensure project success.

19. (d)

20. (d)

CPM	PERT
• Deterministic approach	• Probabilistic approach
• Only one time estimate is required	• Three time estimate (t_o, t_m, t_p)
• Activity oriented diagram	• Event-oriented diagram

21. (c)



Critical path : 1 - 2 - 3 - 5 - 7 - 8

22. (d)

Training of team members in a project is typically managed by the project management office or the project manager depending on the organizations structure. The PMO is responsible for defining project standards, methodologies and training team members in best practices.

23. (a)

A program consists of multiple inter-related projects that are coordinate to achieve greater synergy, efficiency and alignment with strategic objectives. Managing projects under a program helps in better resource sharing and risk management.

24. (d)

While risk analysis involves calculating expected values of risks, a risk not focus on computing expected values for individual risks.

25. (d)

Tuckman's five stages of team development describe how team evolve and improve their effectiveness over time.

- **Forming :** Team members get to know each other, roles are unclear and initial relationships are established.
- **Storming :** Conflicts arise as team members assert their opinions and vie for roles.
- **Norming :** The team begins to develop cohesion, resolve conflicts and establish norms.
- **Performing :** The team reaches peak efficiency, collaboration is strong and goals are achieved smoothly.
- **Adjourning :** The project ends and the team disbands or transitions.

Section B : General Principles of Design, Drawing, Importance of Safety

26. (b)

The planes of projection in first angle projection are assumed to be non-transparent.

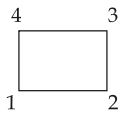
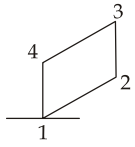
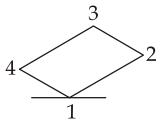
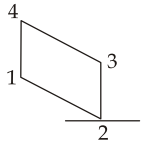
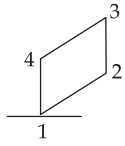
27. (b)

A conic is defined as the locus of a point moving in a plane such that the ratio of its distance from a fixed point and a fixed straight line is always constant. The fixed point is known as focus, whereas the fixed St. line is known as directrix.

28. (b)

When the line is inclined to one reference plane and parallel to the other plane it is inclined to the third reference plane also.

29. (c)

Shape of the object	Isometric shapes when viewed from			
	Front	Top	Left side	Right side
Rectangle 				

30. (b)

The co-ordinates system used in Auto CAD are

1. Absolute co-ordinates.
2. Relative polar coordinates.
3. Relative co-ordinates.
4. Direct distance entry

31. (c)

32. (d)

$$\text{R.F. (Representative fraction)} = \frac{\text{Drawing size}}{\text{Actual size}} = \frac{5\,\text{cm}}{1.5\,\text{km}}$$

$$= \frac{5}{1.5\times10^5} = \frac{1}{30000}$$

$$\text{LOS} = \text{RF} \times L_{\max}$$

$$= \frac{1}{30000}\times 5 = \frac{1}{30000}\times 5\times 10000$$

$$= \frac{50}{3} = 16.67\,\text{cm}$$

33. (a)

S.No.	Position of Line	Front View	Top View
1.	Line parallel to both HP and VP	Parallel to XY and having True length of the line	Parallel to XY and having True length of the line
2.	Line lying on HP and parallel to VP	Lies in XY line and equal to True length	Lies in XY line and equal to True length
3.	Line lying on VP and parallel to HP	Lies above XY and equal to True length	Lies in XY and equal to True length
4.	Line lying on both HP and VP	Lies in XY line and equal to True length	Lies in XY line and equal to True length
5.	Line parallel to VP and perpendicular to HP	Perpendicular to XY and equal to True length	A point
6.	Line parallel to HP and perpendicular to VP	A point	Perpendicular to XY and equal to True length
7.	Line parallel to VP and inclined to HP	Lies above XY and equal to true length	Parallel to XY line and shorter than the true length

34. (b)

$$\text{Equivalent ratio of the mixture } (E_m) = \sum_{i=1}^{n}\frac{C_i}{L_i}$$

$$\therefore \quad E_m = \frac{C_1}{L_1}+\frac{C_2}{L_2}+\frac{C_3}{L_3}$$

$$E_m = \frac{4}{5}+\frac{0.9}{1}+\frac{22}{25} = 2.58$$

35. (b)

Active fire protection system is a group of systems that requires some amount of action or motion in order to work in the event of fire.

36. (d)

The CDM regulation imposes duties to manage construction project, ensure physical safeguards are provided to prevent danger during such projects.

37. (a)

Embodiment design is concerned with three major tasks:

1. Product architecture.
2. Configuration design
3. Parametric design

38. (d)

- **Concurrent engineering :** It brings together multidisciplinary teams in which product developers from different functions work together and in parallel with the intention of getting things right as quickly as possible.
- **Selection design :** Most design employ standard components such as bearings, small motors or pumps that are supplied by vendors specialization in their manufacture and sale.
- **Adaptive design :** This form of design occurs when a known solution is applied to satisfy a different need and a completely new application is produced.

Section C : Basics of Energy and Environment

39. (a)

- The Paris Climate Agreement is a non-binding agreement, which means that countries are not legally required to take specific actions to reduce their Greenhouse gas emissions.
- It aims to limit global warming to well below 2° Celsius, and preferably limit it to 1.5° Celsius, compared to preindustrial levels.
- Under the Agreement, developed countries are required to provide financial assistance to developing countries to help them transition to low-carbon economies and adapt to the impacts of climate change. This financial assistance is known as "climate finance."
- Member countries are required to submit nationally determined contributions outlining the actions they will take to reduce their emissions, and they are encouraged to report regularly on their progress.

40. (a)

Commensalism is a type of biotic interaction in which one species benefits and the other is unaffected.

41. (c)

- Sendai Framework was adopted at the Third United Nations World Conference on Disaster Risk Reduction, held in Sendai, Miyagi, Japan.
- The present Framework applies to the risk of small-scale and large-scale, frequent and infrequent, sudden and slow-onset disasters caused by natural or man-made hazards, as well as related environmental, technological and biological hazards and risks.

- It was adopted by the United Nations General Assembly during the 2015 Third UN World Conference on Disaster Risk Reduction (WCDRR).
- It is the successor instrument of the Hyogo Framework for Action (HFA) 2005-2015: Building Nations' and Communities' Resilience to Disasters.

42. (c)

- Ramsar Convention or the 'Convention on Wetlands' is an intergovernmental environmental treaty established by UNESCO in 1971, and named after the city of Ramsar in Iran, where the convention was signed that year.
- Sundarbans in West Bengal is the largest Ramsar site in India.

43. (d)

44. (a)

- National Clean Air Programme (NCAP) was launched by the Ministry of Environment, Forests and Climate Change (MoEFCC) in January 2019. It is the first-ever effort in the country to frame a national framework for air quality management with a time-bound reduction target.
- It seeks to cut the concentration of coarse particulate matter (PM) of diameter 10 micrometer or less or PM10 and fine particles PM2.5 by at least 20% in the next five years, with 2017 as the base year for comparison.

45. (b)

- Coral reefs, also known as Rainforests of the ocean, the ecosystems that are home to a diverse array of plant and animal life, similar to how rainforests on land are home to a wide variety of plant and animal species.
- Coral reefs are formed by colonies of small, hardy animals called coral polyps that build structures of calcium carbonate. These structures provide a home for countless other species, including fish, crustaceans, mollusks, and many types of algae.
- Zooplankton, phytoplankton, and algae are all important components of the ocean ecosystem, but they are not considered to be rainforests of the ocean.

46. (b)

The organisms which occur primarily or most abundantly in the ecotone are referred to as edge species. In the terrestrial ecosystems, edge effect is especially applicable to the birds.

47. (b)

- Photochemical smog is a type of air pollution that is formed when sunlight reacts with nitrogen oxides (NOx) and volatile organic compounds (VOCs) in the atmosphere. Hence, statement 1 is not correct.
- The major pollutants found in smog are ground-level ozone, nitrogen oxides (NOx), and particulate matter (PM).

48. (d)

- E20 is a blend of 20% ethanol with petrol.
- Ethanol acts as an Octane Number booster, which can lead to improved engine performance and reduced engine knock. This is because ethanol has a high-Octane rating and when blended with gasoline, it raises the overall Octane rating of the fuel, which can result in improved performance and efficiency, particularly in engines with high compression ratios.

49. (c)

- Methane is produced by the breakdown or decay of organic material and can be introduced into the atmosphere by either natural process – such as the decay of plant material in wetlands, the seepage of gas from underground deposits or the digestion of food by cattle–or human activities–such as oil and gas production, rice farming or waste management.
- Methane is responsible for creating ground-level ozone (Tropospheric Ozone), a dangerous air pollutant.

50. (b)

- Particulate Matter is the term for a mixture of solid particles and liquid droplets found in the air. Some are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks or fires.
- Most particles form in the atmosphere as a result of complex reactions of chemicals such as sulfur dioxide and nitrogen oxides, which are pollutants emitted from power plants, industries and automobiles.
- It includes dust, dirt, soot, or smoke, are sometimes large or dark enough to be seen with the naked eye.

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