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

Section A : Basics of Project Management

1. (a)

The Initiating Process Group is focused on formally authorizing the project and defining its initial scope and stakeholders.

- Develop the project charter: This is the foundational action of the initiating phase, giving the project manager formal authority.
- Identify key stakeholders: Identifying everyone involved in or affected by the project is crucial from the outset.
- Release project resources: This activity belongs to the Closing Process Group, at the end of the project.
- Prepare a detailed project report (DPR): Detailed planning and documentation of the project management plan occur within the Planning Process Group.

2. (c)

$$\text{Annual depreciation} = \frac{P - C_S}{n} = \frac{75000 - 10000}{8} = ₹8125$$

$\therefore$ Book value at the end of two years = $75000 - 3 \times 8125 = ₹50625$

3. (c)

The functional manager handles the employee's administrative needs, long-term career path, training, and skills development. The project manager, conversely, is responsible for the specific project goals, timelines, and day-to-day task direction.

4. (d)

All the listed options are valid methods or components used in project scheduling.

- **Bar charts** (often referring to Gantt charts) are a visual method for displaying project timelines.
- **Milestones** are important markers within a schedule indicating key events or the completion of major deliverables.
- **Network diagrams** (such as those used in PERT and CPM) illustrate the sequence and dependencies of tasks.
- **Gantt charts** are a specific and widely adopted form of bar chart used for comprehensive project scheduling.

5. (c)

- **Cost Variance (CV)** is calculated as Earned Value (EV) minus Actual Cost (AC). Both EV and AC represent a monetary value (the budgeted cost of work performed versus the actual cost incurred).
- **Schedule Variance (SV)** is calculated as Earned Value (EV) minus Planned Value (PV). Both EV and PV also represent a monetary value (the budgeted cost of work performed versus the budgeted cost of work scheduled).

6. (a)

$$\text{Project duration, } T = 6 + 5 + 10 + 12 + 4 = 37 \text{ days}$$

$$\text{Variance} = 2^2 + 2^2 + 3^2 + 4^2 + \left(\sqrt{3}\right)^2 = 36$$

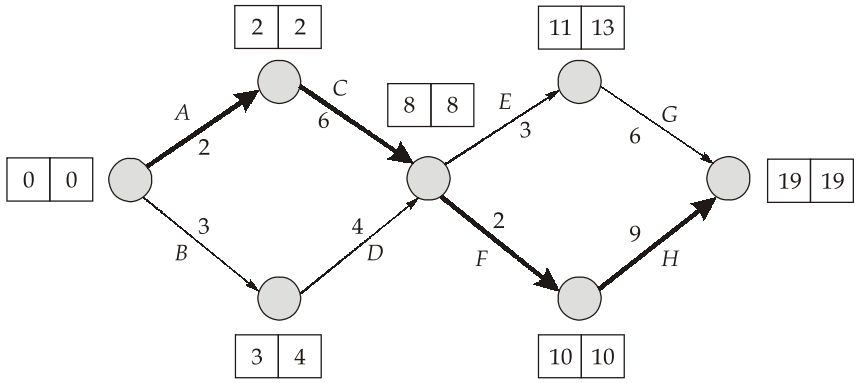
$$\text{Standard deviation, } \sigma = \sqrt{36} = 6$$

$$\text{Range of project duration} = (\text{Minimum time, Maximum time})$$

$$\text{Minimum time} = T - 3\sigma = 19 \text{ days}$$

$$\text{Minimum time} = T + 3\sigma = 55 \text{ days}$$

7. (c)



Hence, critical path is A — C — F — H.

8. (c)

PERT is a project management tool specifically designed for projects with uncertain activity times. It calculates a weighted average of the optimistic, most likely, and pessimistic time estimates to determine a probabilistic expected duration for each task, allowing project managers to estimate project completion times and identify critical paths under uncertainty.

9. (c)

$$\text{Standard deviation, } \sigma = \sqrt{16} = 4 \text{ days}$$

$$Z = \frac{x - \mu}{\sigma} = \frac{35 - 35}{4} = 0$$

$$P(Z = 0) = 50\%$$

$\therefore$ The probability that the project will be completed in 40 days is 50%.

10. (d)

11. (c)

- The project life cycle in project management generally consists of five main phases: Initiation, Planning, Execution, Monitoring and Controlling, and Closure. Initiation is indeed the recognized first step.
- The planning phase is where critical activities like defining objectives, determining project scope, identifying tasks, scheduling, and budgeting occur. This results in the creation of a comprehensive roadmap for the project's execution.

12. (c)

Quality management ensures that a project's outputs and the processes used to create them consistently meet the needs and documented requirements of the stakeholders. It is about fulfilling specific requirements, not simply adhering to the "highest standards" or only inspecting the final product.

13. (b)

$$A = P\left[\frac{i(1+i)^n}{(1+i)^n - 1}\right]$$

$$\text{Capital recovery factor (CRF)} = \frac{i(1+i)^n}{(1+i)^n - 1}$$

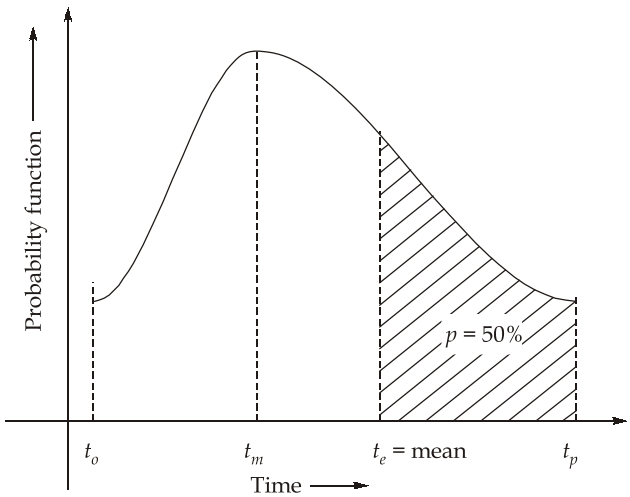
$$i + \text{SFF} = \text{CRF}$$

$$\text{CRF} = 0.15 + 0.148 = 0.298$$

$$A = 100000 \times 0.298$$

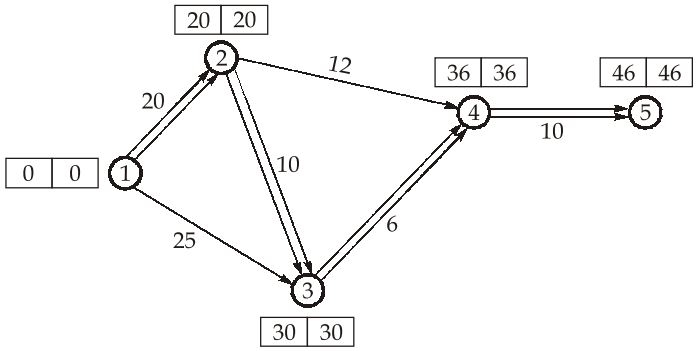
$$A = ₹29800$$

14. (c)

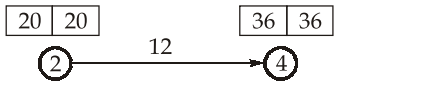


15. (a)

16. (d)



Activity 2-4 is



EST = 20 EFT = 20 + 12 = 32

LST = 36 – 12 = 24 LFT = 36

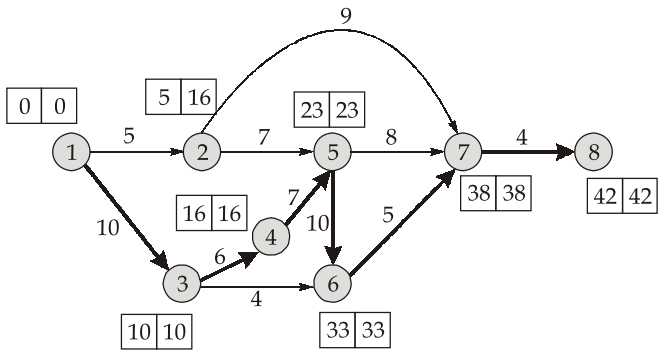
Total float = 36 – 32 = 24 – 20

= 4 days

17. (a)

- The large part of the budget is spent in the project execution phase.
- The project manager understands the characteristics and features of project execution to be able to manage the process effectively.

18. (a)



Critical path : (1) → (3) → (4) → (5) → (6) → (7) → (8)

Project duration = 42 days

19. (c)

Termination by starvation is water a project is not able to sustain due to lack of budget.

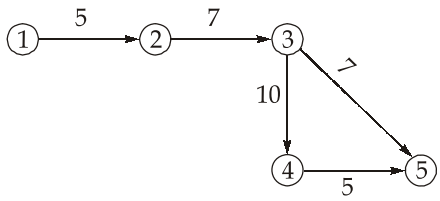
20. (c)

- Contract administration is the process of ensuring each party's performance meets the contractual requirements, managing the relationship, and monitoring compliance throughout the life of the contract. This statement is correct.
- Contract closeout is about finalizing all administrative matters, such as verifying all terms have been met and resolving any final issues, for a contract that has been physically completed (i.e., the actual work or delivery is done). This statement is also correct.

21. (c)

A project charter is a formal document that officially authorizes the existence of a project and grants the project manager the authority to apply organizational resources to project activities. It is typically signed by the project initiator or sponsor during the project initiation phase.

22. (d)



Activity	t_o	t_m	t_p	t_E	$\sigma = \left(\frac{t_p - t_o}{6}\right)$
1 - 2	2	5	8	5	1
2 - 3	4	7	10	7	1
3 - 4	7	10	13	10	1
4 - 5	2	5	8	5	1
3 - 5	4	7	10	7	1

Critical path : $1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5$

Project duration, $\mu = 5 + 7 + 10 + 5 = 27$ days

Standard deviation, $\sigma = \sqrt{1^2 + 1^2 + 1^2 + 1^2} = 2$

Probability factor, $Z = \dfrac{x - \mu}{\sigma}$

$$Z = \frac{30 - 27}{2} = \frac{3}{2} = 1.5$$

From table, $P\% = 95\%$

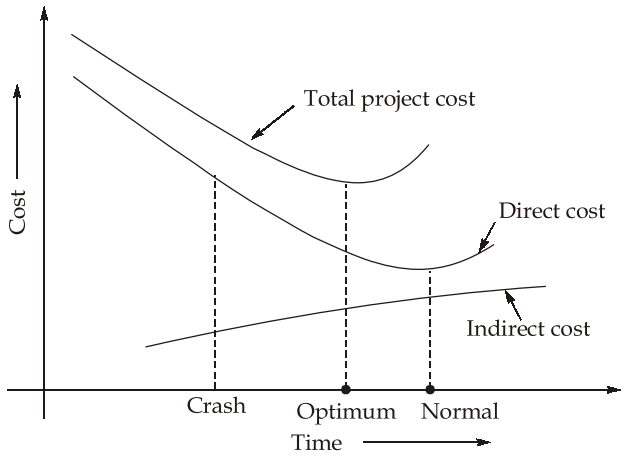
23. (d)

If there are heavy time penalties, the resources must be increased to meet the schedule. This is called time-limited resource scheduling.

Resource-limited resource scheduling is used if the maximum number of resources is fixed and the end date might need to be extended to address any overload.

24. (a)

25. (a)



Direct cost increases on either side of normal duration but at a steady rate on the higher side of normal duration. The time beyond which the direct cost will not be reduced with the increase in time is normal time.

Indirect cost increases with duration.

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

26. (b)

Some positive steps you can take to enhance your creative thinking:

(i) Develop a creative attitude
(ii) Unlock your imagination
(iii) Be persistent
(iv) Develop an open mind
(v) Suspend your judgement
(vi) Set problem boundaries

Barriers to creative thinking

- Perceptual blocks :
  - Stereotyping
  - Information overload
  - Limiting the problem unnecessarily
  - Fixation
  - Priming or provision of cues
- Emotional blocks
- Cultural blocks
- Intellectual blocks
- Environmental blocks

27. (c)

Pugh chart or Datum method :

It compares each concept relative to a reference or datum concept and for each criteria determines whether the concept in question is better than, poorer them, or about the same as the reference concept. Thus, it is a relative comparison technique.

28. (c)

$$\text{Risk priority number} = S \times O \times D$$

$$\text{Criticality} = S \times O$$

S: Severity rating ; O: Occurrence rating; D: Detection rating

29. (c)

There are five types of event symbols

Rectangle: It is the main building block for the analytical tree.

Circle: It represents a base event in the tree.

Diamond: It identifies an undeveloped terminal event.

Oval: An oval symbol represents a special situation that can only happen if certain circumstances occur.

Triangle: The triangle signifies a transfer of a fault tree branch to another location within the tree.

30. (d)

Risk identification may be achieved by a multiplicity of techniques, including physical inspections, management and worker discussions, safety audits, job safety analysis, and HAZOP studies. The study of past accidents can also identify areas of high risk.

31. (d)

Continuous narrow freehand line: Preferably manually represented termination of partial or interrupted views, cuts and sections if the Unit is not a Line of Symmetry or a Centre Line.
Continuous narrow line with zigzags: Preferably mechanically represented termination of partial or interrupted views, cuts and sections if the Limit is not a Line of Symmetry or a Center Line.
Dashed narrow line: Hidden edges, Hidden outlines.

Long-dashed dotted narrow line: Cutting planes at the ends and changes of direction. Initial outlines prior to forming parts situated in front of the cutting plane.

32. (c)

Helix : Helix is defined as a curve generated by a moving point around and along the surface of a right circular cylinder or cone with uniform angular velocity about the axis and with a uniform linear velocity in the direction of the axis.

Spiral : The locus of a point which moves around a centre, called pole, while moving towards or away from the center. The point will move along a line called radius vector while the line itself rotates about one of its end points.

33. (a)

For spheres, if the section plane is inclined to HP/VP, the apparent section will be an ellipse.

34. (d)

When the polyhedral surface representing the faces is bounded with triangular lateral surfaces, all converging to a single point or vertex at the top, it is called a pyramid.

35. (d)

Methods of projection of solids

1. Tilting object method or change of position method.
2. Auxiliary plane method or change of reference line method.

36. (d)

- The development profile of the solid can be made by four methods, namely (a) the parallel line method, (b) radial line method, (c) triangulation method, and (d) approximate method.
- The parallel line method is adopted for developing the lateral surfaces of the solids such as prisms and cylinders that involve the top and the base ends parallel to each other. Any point on the lateral surface can be located parallel to the locus of these ends at its respective height. The development of the prism of n sides consists of n rectangles of size equal to the side of the base of the prism and length or height as the other dimension.
- The radial line development method is adopted for solids such as pyramids and cones that have their base points located radially and equidistant from the apex. Therefore, the development sketch consists of a sector that represents the perimeter and the true length of the slant edge or generator. The development of the lateral surface of a pyramid of base n sides consists of n isosceles triangles of size equal to the base of the pyramid and the true length of the slant edge laid adjacent to each other.
- The triangulation method is used for the development of the lateral surfaces of transition pieces that connect different sizes and shapes.
- The curved surface is attempted by splitting them into triangular portions. Many air-conditioning ducts involve such shapes.
- The development of the surfaces of the objects that involve double curvature or warping like sphere, ellipsoid, paraboloid, helicoids, etc., are attempted by approximation process. The object is sliced into different portions, and each portion is approximated with the nearest solid shape, their development profiles are drawn and combined judiciously.

37. (d)

- Isometric sketch is the type of pictorial projection in which all the three dimensions of an object are not only available in one single picture but appear in equal proportion, enabling the reader to observe the dimensions directly from that sketch.
- In the isometric sketch, the three mutually perpendicular faces, and hence, the three axes of a 3D object appear equally inclined at 120° among themselves and are equally shortened by 81.6%.

- In order to effect this proportionate reduction, a special scale known as isometric scale is drawn. When the isometric sketch is made as per this scale, it is called isometric projection. When the original dimensions of the object are used, the resulting sketch is called the isometric view or isometric drawing. Both of them convey the same shape of the object.

38. (c)

According to Clause 4.2.2 of Part-4 of National Building Code (NBC), 'Lifts and Escalators shall not be considered as fire exits' because in case of failure of electricity, lifts and escalators tend to suddenly stop in between floors trapping the occupants of the lift, and creating chaotic conditions. Also, if lifts are not properly fire separated by fire resistant shafts/lift lobbies and fire doors at every entrance, they create a stack effect carrying the fire from floor to floor.

- A horizontal exit is passage through a fire-resistant well to an area of refuge on the same level in the same building or in an adjacent building. Horizontal exits are particularly useful during fire emergencies in hospitals for evacuation of bedridden patients suffering from immobility.

Section C : Basics of Energy and Environment

39. (a)

- The Convention on Biological Diversity covers biodiversity at all levels: ecosystems, species and genetic resources. It also covers biotechnology, including through the Cartagena Protocol on Biosafety.
- The Secretariat of the Convention on Biological Diversity (CBD) is based in Montreal, Canada.
- Cartagena Protocol under the convention governs the movements of living modified organisms. It is related to the establishment of a Biosafety Clearing- House.

40. (d)

- World Wide Fund for Nature (WWF) is an international non-governmental organization founded in 1961. It was formerly named the World Wildlife Fund, which remains its official name in Canada and the United States.
- It is the world's largest conservation organization with over five million supporters worldwide, working in more than 100 countries, supporting around 1,300 conservation and environmental projects.
- The Living Planet Report is published every two years by WWF since 1998. It is based on living planet index and ecological footprint calculation.
- WWF publishes the Living Planet Index in collaboration with the Zoological Society of London. Along with ecological footprint calculations, the Index is used to produce a bi-yearly Living Planet Report giving an overview of the impact of human activity on the world.

41. (a)

Forest Survey of India (FSI)

- It is a premier national organization under the Union Ministry of Environment, Forest and Climate Change responsible for assessment and monitoring of the forest resources of the country regularly.
- Established on June 1, 1981, the Forest Survey of India succeeded the "Preinvestment Survey of Forest Resources" (PISFR), a project initiated in 1965 by Government of India with the sponsorship of FAO and UNDP.
- It is responsible for preparing the State of Forest Report biennially which provides assessment of latest forest cover in the country and monitoring changes required.

42. (d)

- The Kyoto Protocol was the first agreement between nations to mandate country-by-country reductions in greenhouse-gas emissions. It was emerged from the UN Framework Convention on Climate Change (UNFCCC), which was signed by nearly all nations at the 1992 mega-meeting, popularly known as the Earth Summit.
- Clean Development Mechanism (CDM), defined in Article 12 of the Protocol, allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project in developing countries.

43. (b)

44. (c)

- Photic zone is the upper layer of the aquatic ecosystems, up to which light penetrates and within which photosynthetic activity is confined. The depth of this zone depends on the transparency of water.
- Both photosynthesis and respiration takes place in the photic zone.

45. (d)

46. (c)

- Water pollution by organic wastes is measured in terms of Biochemical Oxygen Demand (BOD).
- Biological Oxygen Demand is the amount of dissolved oxygen needed by bacteria in decomposing the organic wastes present in water.
- It is expressed in milligrams of oxygen per litre of water.
- The higher value of BOD indicates low Dissolved Oxygen content of water.
- BOD is limited to biodegradable materials only; hence it is not considered a much reliable method of measuring pollution load in the water.
- Chemical oxygen demand (COD) is a slightly better mode used to measure pollution load in the water. COD is the measure of oxygen equivalent to the requirement of oxidation of total organic matter (i.e. biodegradable and non-biodegradable) present in water.

47. (c)

- Classical Smog/Sulphurous Smog/London Smog is also called 'reducing smog'.
- The term 'Smog' was first used in 1905 by Dr. H.A. Des Voeux to describe the conditions of fog that had soot or smoke in it.
- Smog is a combination of various gases with water vapour and dust.

48. (d)

Saponification is the formation of a metallic salt of a fatty acid; such a salt is called soap. The reaction involves the treatment of free fatty acids and/or glycerides with a base and may be considered a special case of hydrolysis when a glyceride is reacted with a base.

49. (d)

- The Pneumatophores help in obtaining oxygen in an otherwise anaerobic substrate.
- Mangroves are a group of trees and shrubs that live in the coastal intertidal zone.
- Mangroves grow in areas with low oxygen soil, where slow-moving waters allow fine sediments to accumulate.

50. (b)

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