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QUESTIONS WITH DETAILED SOLUTIONS

GENERAL STUDIES & ENGINEERING APTITUDE

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SUBJECTWISE WEIGHTAGE

S.No.	Name of the Subject	No. of Questions
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	Total No. of Questions	**100**

01. Match the following :

List-I

A. Thompson B. James P. Joule

C. Max Planck D. Albert Einstein

List-II

1. The concept of converting mechanical work into heat
2. The theory of relativity
3. The energy characteristics of light
4. The energy equivalence between heat, work and electric power

Select the correct matching using the code given below :

	A	B	C	D		A	B	C	D
(a)	3	4	1	2	(b)	1	4	3	2
(c)	3	2	1	4	(d)	1	2	3	4

01. Ans: (b)

Sol: Heat was not formally recognized as a form of energy until about 1798, when Count Rumford (Sir Benjamin Thompson), a British military engineer, noticed that limitless amounts of heat could be generated in the boring of cannon barrels and that the amount of heat generated is proportional to the work done in turning a blunt boring tool. His observation of the proportionality between heat generated and work done lies at the foundation of thermodynamics.

Thompson - The concept of converting mechanical work to heat

James P Joule - The energy equivalence between heat, work and electric Power

Max Planck - He worked on energy characteristics of light (Quantization of Photons)

Albert Einstein - Hew worked on theory of relativity

02. According to UNEP, which of the following is/are the major component/s of air pollution ?

1. SO_2 2. O_3
3. CO 4. NO_2

Select the correct answer using the code given below :

(a) 2 and 3 only (b) 2 only

(c) 2, 3 and 4 only (d) 1, 2, 3 and 4

02. Ans: (d)

Sol: According to UNEP, the major air pollutants are NO_2, So_2, PM, CO, NH_3, VOC, O_2.

03. Which one of the following is a 'soft coal' ?

(a) anthracite (b) bituminous

(c) lignite (d) magnetite

03. Ans: (b)

Sol: Anthracite : Hard Coal

Bituminous : Soft Coal

Lignite : Brown Coal

Peat : Newly formed Coal

04. Which one of the following is NOT correctly matched pair regarding the regional biodiversity ?

(a) Point richness: The number of species that can be found at a single point in a given space

(b) Alpha richness: The number of species found in a small heterogeneous area

(c) Beta richness: The rate of change in species composition across different habitats

(d) Gamma richness: The rate of change across large landscape gradients

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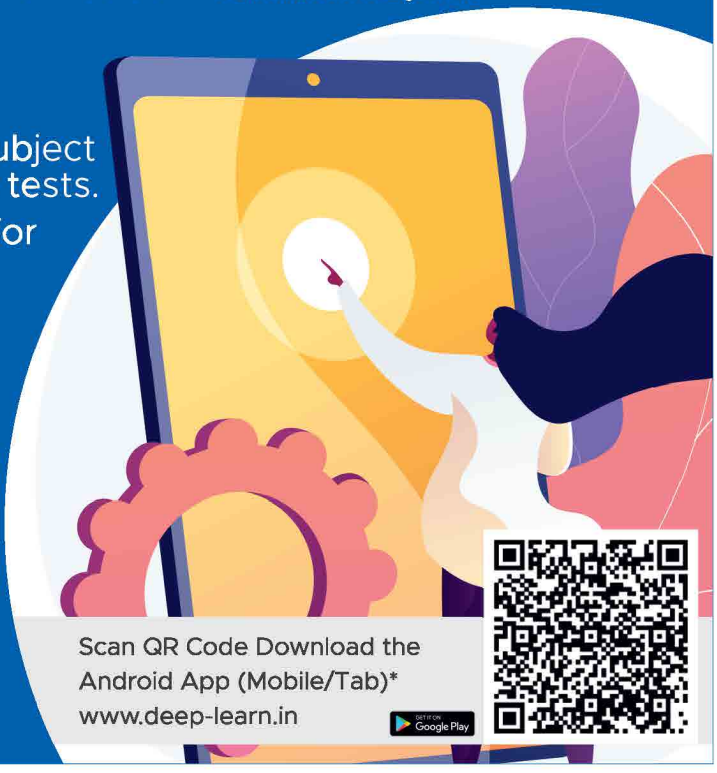

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04. Ans: (a)

Sol: **Point Richness:** This is the number of SPS that can be found at a single point in a given space.

Alpha diversity Richness: This is a number of spacies that can be found at a single Homogeneous area.

Beta Richness: This the rate of change in species composition across different habitats.

Gamma Richness: This is the rate of change across the large land scape gradient.

05. Energy services for sustainable development are directly linked to

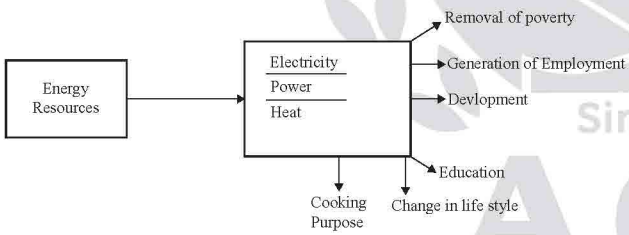
1. Poverty
2. Lifestyles
3. Women
4. Deforestation

Select the correct answer using the code given below :

(a) 1, 2 and 3 only (b) 1, 2 and 4 only
(c) 2, 3 and 4 only (d) 1 and 3 only

05. Ans: (a)

Sol:



06. Match the following :

List-I

A. Oligotrophic lakes B. Dystrophic lakes
C. Meromictic lakes D. Impoundments

List-II

1. created due to construction of dams
2. low pH and high humic acid content
3. low nutrient concentration
4. rich in salts and permanently stratified

Select the correct matching using the code given below :

	A	B	C	D		A	B	C	D
(a)	4	1	3	2	(b)	4	1	2	3
(c)	3	2	1	4	(d)	3	2	4	1

06. Ans: (d)

Sol: **Oligotrophic Lakes:** Nutrient concentration is low.

Dy-strophic Lake : Low PH value lake, also know as Brown water. These are also refereed to as Homid lake.

Meromictic Lake: These have layers of water that do not mix and are preponderantly stratified.

Impoundments: Created due to construction of dams.

07. Which one of the following is NOT included in the 27 principles issued at the Rio-92 UN Conference on the Environment and Development ?

(a) The right to development that meets the needs of present and future generations
(b) Right to safety from natural disasters
(c) Protection to the environment in times of armed conflict
(d) Youth mobilization for a global partnership

07. Ans: (c)

Sol: **Principle 1**

Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

Principle 2

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

Principle 3

The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.

Principle 4

In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.

Principle 5

All States and all people shall cooperate in the essential task of eradicating poverty as an indispensable requirement for sustainable development, in order to decrease the disparities in standards of living and better meet the needs of the majority of the people of the world.

Principle 6

The special situation and needs of developing countries, particularly the least developed and those most environmentally vulnerable, shall be given special priority. International actions in the field of environment and development should also address the interests and needs of all countries.

Principle 7

States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.

Principle 8

To achieve sustainable development and a higher quality of life for all people, States should reduce and eliminate unsustainable patterns of production and consumption and promote appropriate demographic policies.

Principle 9

States should cooperate to strengthen endogenous capacity-building for sustainable development by improving scientific understanding through exchanges of scientific and technological knowledge, and by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies.

Principle 10

Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.

Principle 11

States shall enact effective environmental legislation. Environmental standards, management objectives and priorities should reflect the environmental and developmental context to which they apply. Standards applied by some countries may be inappropriate and of unwarranted economic and social cost to other countries, in particular developing countries.

Principle 12

States should cooperate to promote a supportive and open international economic system that would lead to economic growth and sustainable development in all countries, to better address the problems of

environmental degradation. Trade policy measures for environmental purposes should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade. Unilateral actions to deal with environmental challenges outside the jurisdiction of the importing country should be avoided. Environmental measures addressing transboundary or global environmental problems should, as far as possible, be based on an international consensus.

Principle 13

States shall develop national law regarding liability and compensation for the victims of pollution and other environmental damage. States shall also cooperate in an expeditious and more determined manner to develop further international law regarding liability and compensation for adverse effects of environmental damage caused by activities within their jurisdiction or control to areas beyond their jurisdiction.

Principle 14

States should effectively cooperate to discourage or prevent the relocation and transfer to other States of any activities and substances that cause severe environmental degradation or are found to be harmful to human health.

Principle 15

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Principle 16

National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment.

Principle 17

Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority.

Principle 18

States shall immediately notify other States of any natural disasters or other emergencies that are likely to produce sudden harmful effects on the environment of those States. Every effort shall be made by the international community to help States so afflicted.

Principle 19

States shall provide prior and timely notification and relevant information to potentially affected States on activities that may have a significant adverse transboundary environmental effect and shall consult with those States at an early stage and in good faith.

Principle 20

Women have a vital role in environmental management and development. Their full participation is therefore essential to achieve sustainable development.

Principle 21

The creativity, ideals and courage of the youth of the world should be mobilized to forge a global partnership in order to achieve sustainable development and ensure a better future for all.

Principle 22

Indigenous people and their communities, and other local communities, have a vital role in environmental management and development because of their knowledge and traditional practices. States should recognize and duly support their identity, culture

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and interests and enable their effective participation in the achievement of sustainable development.

Principle 23

The environment and natural resources of people under oppression, domination and occupation shall be protected.

Principle 24

Warfare is inherently destructive of sustainable development. States shall therefore respect international law providing protection for the environment in times of armed conflict and cooperate in its further development, as necessary.

Principle 25

Peace, development and environmental protection are interdependent and indivisible.

Principle 26

States shall resolve all their environmental disputes peacefully and by appropriate means in accordance with the Charter of the United Nations.

Principle 27

States and people shall cooperate in good faith and in a spirit of partnership in the fulfillment of the principles embodied in this Declaration and in the further development of international law in the field of sustainable development.

08. What are the objectives and functions of state financial corporations ?

1. The main function is to provide non-term loans for the acquisition of land, building, plant, machinery and other movable assets.
2. To finance expansion, modernization and upgradation of technology in the existing units.
3. To assist for the promotion of industry by the rural and urban artisans.
4. Providing seed capital assistance under the scheme of Industrial Development Bank of India.

Select the correct answer using the code given below :

(a) 1, 2 and 3 only (b) 2, 3 and 4 only
(c) 1, 2 and 4 only (d) 1, 3 and 4 only

08. Ans: (c)

Sol: The State Finance Corporations (SFCs) are an integral part of institutional finance structure of a country. SFC promotes small and medium industries of the states. Besides, SFC help in ensuring balanced regional development, higher investment, more employment generation and broad ownership of various industries.

09. From the following, which facilities are provided for units in the export processing zone ?

1. Developed plots/ready-buildings to suit project requirements.
2. Second hand capital goods allowed to be exported.
3. Foreign equity participation up to 100% permissible.
4. Assured power supply, preferential power connection.

Select the correct answer using the code given below :

(a) 1, 2 and 4 only (b) 1, 2 and 3 only
(c) 1, 3 and 4 only (d) 2, 3 and 4 only

09. Ans: (c)

Sol: Objectives of setting up of EPZs

- Encourage and generate the economic development
- Encourage Foreign Direct Investments (FDI)
- To channel the sources of foreign exchange within the system in a phased manner
- Foster the establishment and development of industrial enterprises within the said zones
- Encourage and generate wider economic activities by encouraging foreign investments for the development of the zones

- To channel the foreign exchange earnings for the further development of these zones and explore new areas for the development of Indian exports
- Encourage establishment and development of Indian industries and business enterprises and facilitate with proper infrastructure Generate employment opportunity
- Upgrade labor and management skills
- Acquire advanced technology for increased productivity
- Ensure world class quality of products

Source: https://business.mapsofindia.com/epz/

10. Which one of the following is NOT the purpose of the organization breakdown structure ?
    (a) To provide a framework to summarize organization unit work performance
    (b) Do not tie the organization unit to cost control accounts
    (c) Identify organization units responsible for work packages
    (d) How the firm has organized to discharge work responsibility

10. Ans: (b)

Sol:

- Organizational breakdown structure (OBS) is a specific type of organization chart that shows which organizational units are responsible for which work packages.
- OBS is a depiction of the project organization arranged so as to relate workpackage to organizational units.
- OBS is used to show which works components have bee assigned to which organizational units.

11. Phillip Kotler argues that the 4 Ps which represent the seller's thinking more than buyer's thinking can be translated into the 4 Cs. Match the following :

4 Ps of Marketing	**4 Cs of Marketing**
Planning	**Planning**
A. Product	1. Customer communication
B. Price	2. Customer value
C. Place	3. Customer costs
D. Promotion	4. Customer convenience

Select the correct matching using the code given below :

	A	B	C	D		A	B	C	D
(a)	2	3	4	1	(b)	2	3	1	4
(c)	1	4	3	2	(d)	1	4	2	3

11. Ans: (a)

Sol:

4Ps	Marketing Mix	4Cs
Product		Customer Value
Price		Cost
Place		Convenience
Promotion		Communication

12. The Boston Consulting Group matrix classifies business in four categories as "STAR", "QUESTION MARK", "CASH COWS",. Which one of the following is the fourth one?
    (a) CATS (b) HORSES
    (c) DOGS (d) HENS

12. Ans: (c)

Sol: Boston consulting group (BCG) matrix

Market share High (cash generation)

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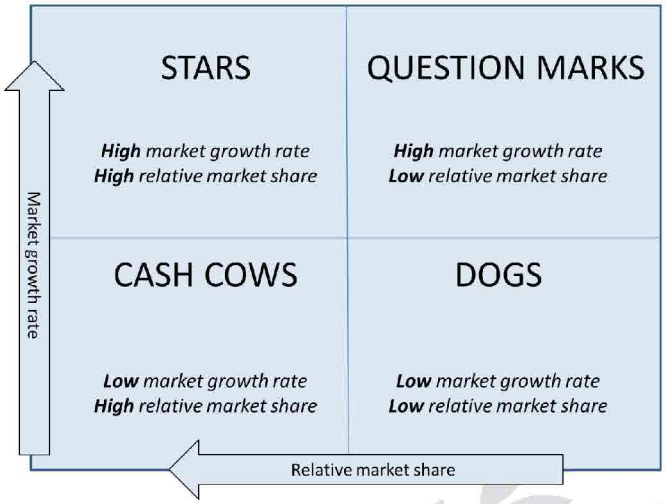

13. Under which one of the following circumstances is the project accepted as worthwhile, keeping the principal non-discounting criteria ?
(a) The payback period (PBP) > target period
(b) The payback period (PBP) < target period
(c) The payback period (PBP) = target period
(d)The payback period (PBP) = 0

13. Ans: (b)

Sol: Non- discounting criteria
Play back period should be less 6Ω the most economic project playback period (PBP) < target period

14. The purpose of oil in a transformer is to
(a) protect the transformer from rusting
(b) avoid wear and tear of the transformer
(c) transfer heat from winding and core to the cooling surfaces of the transformer
(d) avoid noise in a transformer

14. Ans: (c)

Sol: The oil is used to cool down the winding and core of transformer, which is heated due to voltage ups & down. And also oil act as an insulator between windings so that short circuits are avoided.

15. For a semiconductor to be called as p-type semiconductor,which one of the following element impurities are added to a pure semiconductor?
(a) Phosphorus (b) Arsenic
(c) Antimony (d) Boron

15. Ans: (d)

Sol: The elemental impurities are added P-type (Trivalent) semiconductor is
- Boron, Alunimium, Gallium, Indium.

16. Impure semiconductor
(a) has more conductivity in contrast to pure semiconductor
(b) has less conductivity in contrast to pure semiconductor
(c) has electrons and holes in equal number
(d) has a fermi level which is in the centre of conduction and valence bands

16. Ans:(a)

Sol: An impure semiconductor is formed by adding impurities to the intrinsic semiconductor.
The impurity elements are B, Al, Ga, N, P, As etc.
By adding impurities more free electrons (or) holes are formed and hence conductivity of material increases.

17. Which one of the following is the disadvantage of ion-implantation over diffusion doping ?
(a) It is a low temperature process
(b) Point imperfections are not produced
(c) Shallow doping is possible
(d) Gettering is possible

17. Ans: (d)

Sol: Two methods are used for introducing impurities into Si semiconductor,
1. **Diffusion:** Dopant atoms move from the surface in Si by thermal means via substitutional or interstitial diffusion mechanism.

2. **Ion implantation:** Dopant atoms are forcefully added into Si in the form of energetic ion beam injection.

The main disadvantage of ion implantation is gettering that is creation of defect in Si crystal (damage of target) to implant high velocity ions.

18. Which one of the following is correct in n-p-n transistor ?
   (a) Collector and emitter terminals can be exchanged
   (b) Collector is heavily doped, base width is small and emitter area is large
   (c) Emitter, base and collector regions are equally doped
   (d) Emitter is heavily doped, based width is small and collector area is large

18. Ans: (d)

Sol: The n-P-n transistor:
1. In most transistor, emitter is heavily doped, its job is to emit or inject electrons into the base.
2. The bases are lightly doped and very thin, it possess most of the emitter - injected electrons on to the collector.
3. The doping levels of collector is intermediate between the heavy doping of emitter and light doping of the base.
4. The collector is the largest of the three regions, if must dissipate more heat than the emitter or base.

19. Which one of the following factors does NOT characterize the formation of non-crystalline structure ?
   (a) Presence of primary bonds in the directions
   (b) Non-formation of three-dimensional primary bond.
   (c) Weak secondary bond
   (d) Open network of the atomic packing

19. Ans: (a)

Sol: The characteristics of formation of non- crystalline structure.

1. There is no definite packing of atoms, which makes them to possess any random shape.
2. There atoms are bonded by weak secondary bonds.
3. Low density
4. Primary bonds are also present but not in directional.

Ex: some polymers, glans

20. Which one of the following protocols is used to address the true routing decisions problems ?
   (a) Exterior Gateway Protocol
   (b) Border Gateway Protocol
   (c) Open Shortest Path First Protocol
   (d) Interior Gateway Routing Protocol

20. Ans: (c)

Sol: Open Shortest Path First (OSPF) is a link-state routing protocol that is used to find the best path between the source and the destination router using its own Shortest Path First).

21. Which one of the following standards is used in vehicular communication system ?
   (a) IEEE 802.11a (b) IEEE 802.11p
   (c) IEEE 802.11g (d) IEEE 802.11h

21. Ans: (b)

Sol: IEEE 802.11p is an approved amendment to the IEEE 802.11 standard to add wireless access in vehicular environments (WAVE), a vehicular communication system. It defines enhancements to 802.11 (the basis of products marketed as (Wi-Fi) required to support Intelligent Transportation Systems (ITS) applications.

22. Which of the following network metrics are used to evaluate the performance of a network?
(a) Throughput and Delay
(b) Reliability and Security
(c) Topology and Type of connection
(d) Portability and Security

22. Ans: (a)

Sol: To calculate the performance of a network, we use the following parameters:
(i) Throughput/ Bandwidth/ Efficiency
(ii) Delay or Time
(iii) RTT (Round Trip Time)
(iv) Bandwidth – delay Product.

23. Which of the following things are defined by uniform resource locator for specifying the information on the internet ?
(a) protocol, host computer, throughput and delay
(b) host computer, destination computer and delay
(c) throughput, delay, port and path
(d) protocol, host computer, port and path

23. Ans: (d)

Sol: Exp: The URL defines 4 things: They are
(i) Protocol
(ii) Host Computer
(iii) Port
(iv)Path
Therefore, the syntax of the URL is protocol: // host:port/path

24. Which one of the following documents are created and handled by the Common Gateway Interface (CGI) technology ?
(a) Dynamic documents
(b) Static documents
(c) Tampered documents
(d) Linked documents

24. Ans: (a)

Sol: Virtual, or dynamic, document creation is at the heart of CGI. Virtual documents are created on the fly in response to a user's information request. You can create virtual HTML, plain text, image, and even audio documents.

25. Which one of the following learnings uses web technology to conduct conventional classes with distant learners ?
(a) Learner-led e-learning
(b) Instructor-led e-learning
(c) Telementoring and e-coaching
(d) Facilitated e-learning

25. Ans: (b)

Sol: There are several ways e-learning is used today.

- Learner-led-e-learning It aims to deliver highly effective learning experiences to independent learners. Content may consist of web pages, multimedia presentations, and other interactive learning experiences housed and maintained on a web server.
- Instructor led-e-learning It uses Web technology to conduct conventional classes with distant learners. These classes use a variety of real-time technologies, such as video and audio conferencing, chat, screen-sharing, polling whiteboards, and the plain old telephone.
- Facilitated e-leaning It combines the reliance on Web content found in learner-led e-learning with collaborative facilities found in instructor-led e-learning. It works well for learners who cannot conform to the rigid schedule of class room training but who want to augment learning through discussion with other learners as well as with a facilitator.

26. Which one of the following frame-works is developed to assess the value of the increasing investments made on e-governance projects in terms of service orientation, technology architecture, replicability and sustainability in various states across the country ?
(a) eTechnology Group@IMRB
(b) e-Governance Assessment Frame-work
(c) Sustainable Access in Rural India
(d) e-Governance Action Plan

26. Ans: (b)

Sol: Assessment of e-Governance Projects

The Department of Electronics and Information Technology (DeitY) as part of its overall e-Assessment strategy proposes to list, identify and conduct independent third party assessment of e-Governance and ICT for Development (ICT4D) projects that provide any measure of e-Governance services, across India, in order to understand the impact, utility, sustainability, scalability and replicability of these projects.

DeitY has been undertaking independent third party assessment of projects since 2007.

Framework of Assessment

In order to undertake assessment of project and enable comparision of project performance across projects and across implementation geographies, all projects are assessed on an Assessment Framework which is customised to each project. The broad parameters of assessment – assessing impact on outreach, cost of accessing services, quality of services and overall governance across projects remain the same.

27. Which one of the following services does NOT come under category of Cloud computing ?
(a) IaaS (Infrastructure as a Service)
(b) Saas (Software as a Service)
(c) PaaS (Platform as a Service)
(d) BDaaS (Big data as a Service)

27. Ans: (d)

Sol: Exp: The wide range of services offered by cloud computing companies can be categorized into three basic types: they are
(i) Infrastructure as a Service (IaaS)
(ii) Platform as a Service (PaaS)
(iii)Software as a Service (SaaS)

28. What is the key size of Data Encryption Standard algorithm in cryptography ?
(a) 56 bit (b) 62 bit
(c) 168 bit (d) 128 bit

28. Ans: (a)

Sol: DES works by encrypting groups of 64 message bits, which is the same as 16 hexadecimal numbers. To do the encryption, DES uses "keys" where are also apparently 16 hexadecimal numbers long, or apparently 64 bits long. However, every 8th key bit is ignored in the DES algorithm, so that the effective key size is 56 bits.

29. Which one of the following statements is NOT correct about the codes of conduct ?
(a) These cover general guiding principles
(b) Their purpose is to regulate the conduct of members on various transactions
(c) These are the broader sets of principles that are designed to inform specific laws or government actions
(d) These translate the values into specific behavioral standards, keeping in mind the possible reflection on the stakeholders interest

29. Ans: (c)

Sol: Codes of ethics do not deal with laws or government actions. They are formulated by professional bodies to govern in their members.

(ACE material Page No. 28)

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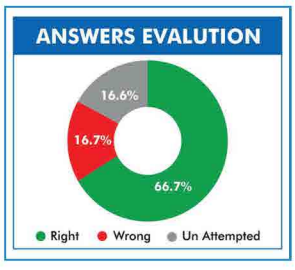

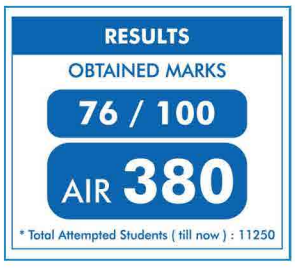

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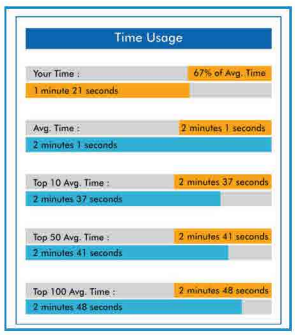

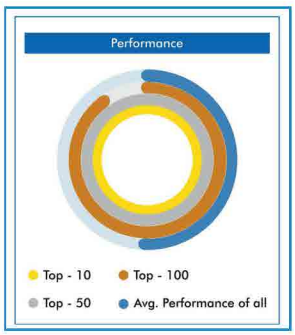

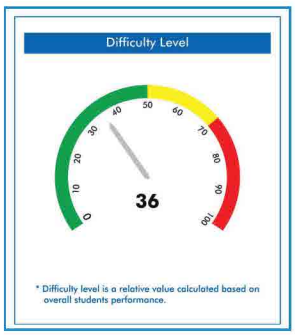

30. The famous statement "The weak can never forgive. Forgiveness is the attribute of the strong" is given by
(a) Swami Vivekananda (b) Mahatma Gandhi
(c) Martin Luther (d) Sri Aurobindo

30. Ans: (b)

Sol: Mahatma Gandhi said, "The weak can never forgive; forgiveness is the attribute of the strong." He meant that this act should be heart and soul but not a symbolic service or a name sake act. He intends to emphasis that people don't really want to forget, forgive and move on.

31. Match the following :

List-I	List-II
A. Act Utilitarian Theory	1. John Locke
B. Rule Utilitarian Theory	2. Immanuel Kant
C. Duty Ethics Theory	3. Richard Brandt
D. The Rights Theory	4. J. S. Mill

Select the correct matching using the code given below :

	A	B	C	D		A	B	C	D
(a)	4	3	1	2	(b)	4	3	2	1
(c)	1	2	3	4	(d)	1	2	4	3

31. Ans: (b)

Sol: Duty ethics was proposed by Immanuel Kant.
Right theory was proposed by John Locke.
Either of these two can be used to filter out the incorrect options. This leave has the answer.

(ACE material Page No. 23)

32. Which pilosopher suggested Wisdom, Courage, Temperance and Justice as four 'cardinal virtues?
(a) Aristotle (b) Aquinas
(c) Socrates (d) Plato

32. Ans: (d)

Sol: Plato proposes the four ethics of virtue. Wisdom refers to the habit of being in happiness always, having knowledge of good and bad, and having good judgment of what to do and what not to do.
Courage is the habit of being unmoved by fear, boldness of obedience to wisdom and being intrepid in death.
Temperance is the habit of moderation in use of pleasurable things.
Justice is the habit of rendering the other his/her rights, respecting and abiding by the law.

33. 'Groupthink', a neteworthy feature of the organizational settings within which engineers work and deliberate in groups, has been suggested by
(a) Abraham Maslow (b) Irving Janis
(c) B.F. Skinner (d) Christopher Meyers

33. Ans: (b)

Sol: Groupthink is a phenomenon that occurs when the desire for group consensus overrides people's common sense desire to present alternatives, critique a position, or express an unpopular opinion. ... Two well-known examples of Groupthink in action are the Challenger Space Shuttle disaster and the Bay of Pigs invasion.

(ACE material Page No. 65)

34. Select inappropriate statement about integrity
(a) It involves the discovery and communication of the truth
(b) It leads to a concern for the whole situation in decision-making, including an awareness of the professional's own attitudes, standards and value systems
(c) It is simply truthfulness or avoidance of lying
(d) It ensures that the professional does not accept 'moral distance'

34. Ans: (c)

Sol: Integrity is a charter to be built based on a law abiding person who also conducts self according to established standards and value systems irrespective of time frame. It is being truthful to one self as well as others always. Therefore a person with integrity is a moral person. Integrity beyond truthfulness or avoidance of lying

(ACE material Page No. 77)

35. Whistleblowing in an organizational set up affects:
1. Peer professional relationships
2. Relationships with management
3. Family relations

Which of the above statements is/are correct?

(a) 1 and 2 only (b) 2 only
(c) 1, 2 and 3 (d) 1 only

35. Ans: (a)

Sol: A Whistelblower is a morally right person who intents to bring the unethical practices an organization indulges in to the notice of the public when the management does not entertain the appeals.

The consequence of Whistleblowing are strained relationship with colleagues and also hostility with the management. However the professional act of the employee do not have a bearing on the family or personal relationships etc.

(ACE material Page No. 57)

36. Carol Gilligan is associated with

(a) the natural justice (b) the responsibility
(c) the principle of loyalty (d) the ethics of care

36. Ans: (d)

Sol: Carol Gilligan advocates that ethical theories are heavily biased towards logic reasoning and punishment rather than focusing on emotional and fairness aspects of human emotions. She proposes that no dilemma can be resolved completely without the willing acceptance of the participants or affected people. She proposes that emotions of the people need to be addressed with care, justice, and fairness.

(ACE material Page No. 19)

37. Hooch & Bootlegging refer to

(a) the prohibition law on unethical practices related to liquor
(b) laws against giving money to beggars as a generous act
(c) food a dulteration rules
(d) laws on checking the illegal business of duplicate goods

37. Ans: (a)

Sol: Hooch refers to illicit liquor and bootlegging refers to manufacturing, distribution and sale of liquor in illegal ways. The prohibition law on Hooch and Bootlegging refers to prohibition of unethical practices in liquor business. Liquor is a state subject and both state and central governments are collectively responsible for supervising and monitoring unethical practices.

38. The ministry of Sports and Youth Affairs has recently approved the inclusion of four indigenous games to be part of Khelo India Youth Games 2021. Which one of the following is NOT included?

(a) Thang-Ta (b) Lagori
(c) Kalaripayattu (d) Gatka

38. Ans: (b)

Sol: Sports Ministry came up with the decision to add four more Indigenous Games in the competition. These sports would be Gatka, Kalaripayattu, Thang-Ta and Mallakhamba.

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Explaining these sports, Gatka happens to be a traditional fighting style that originated in the state of Punjab, used as mostly as self-defence, while it is also a sport nowadays. As for Kalaripayattu, it stems from Kerala and happens to be a combat sport involving a sword and a shield, while it a popular sport in the state. Thang-Ta is once again a sword combat sport, which mainly hails from the North-East state of Manipur. Meanwhile, Mallakhamba is a popular structural sport, famous in Madhya Pradesh and Maharashtra, as it is mostly performed on festive occasions, which sees men standing over each other to replicate a symbolic structure.

Source: https://newsable.asianetnews.com/gallery/sports/khelo-india-youth-games-2021-kalaripayattu-mallakhamba-among-4-new-games-ayh-qlokge#image3

39. Which one of the following is the latest in series being organized as the largest virtual gathering to create dialogues, and accelerate innovation in agriculture?
(a) Agri-India hackathon 2020
(b) National Agriculture Higher Education project
(c) ENSURE
(d) National Mission for Sustainable Development

39. Ans: (a)

Sol: The Indian Council of Agricultural Research (ICAR) has started organising KRITAGYA- a National level hackathon to promote innovation in agriculture and allied sectors in the country.

Advantages of organising Agri-Hackathon are to give opportunity to the students along with faculties, innovators for showcasing their innovative approaches & technologies in agriculture and allied sectors.

40. Match the following:

I	II
A. Utkarsh Bangla Scheme	1. West Bengal
B. Placement Linked Skill Training Programme	2. Rajasthan
C. SURYA Scheme	3. Haryana
D. Employment Linked Skill Training Programme	4. Assam

Select the correct matching using the code given below:

	A	B	C	D		A	B	C	D
(a)	2	3	4	1	(b)	2	3	1	4
(c)	1	4	3	2	(d)	1	4	2	3

40. Ans: (c)

Sol:

1. West Bengal government has launched the Utkarsh Bangla Scheme with an aim of providing vocational training to school dropouts. Objective of the scheme is to give vocational training to school dropouts by providing training ranging from 400 to 1200 hours free of charge. Under this scheme, beneficiaries will be trained in driving, tailoring, repairing television and other electronic equipment's, beautician courses etc. Utkarsh Bangla" has won the prestigious World Summit on the Information Society (WSIS) awards under the aegis of the United Nations. Out of 1062 nominations in 18 categories, "Utkarsh Bangla" got the topmost award and emerged a winner in Capacity Building category.

   Source: http://north24parganas.gov.in/department/utkarsha_bangla

2. Assam Skill Development Mission (ASDM) was formed under the aegis of Department of Skill, Employment & Entrepreneurship with the aim to

provide quality skill training to the youth leading to meaningful employment.

Source: https://skillmissionassam.org/images/Prospectus_NESC.pdf

3. Surya Scheme – Haryana

Source: https://hsdm.org.in/index.html

4. RSLDC - ELSTP. It aims at developing and implementing skill development programs across Rajasthan. The main focus of this program is to empower the youth by providing them dedicated skill training and place them in various sectors/ industries.

Source: https://www.ildindia.org/projects.php?s=3

41. With a view to encourage and promote Indian artisans and their handicraft, Hunar Haat offers an effective plat form. Where was the 22nd Hunar Haat held?

(a) Jaipur (b) Ferozpur

(c) Rampur (d) Bharatpur

41. Ans: (c)

Sol: "Hunar Haat" has strengthened the commitment to "Sabka Sath, Sabka Vikas, Sabka Vishwas" and has been providing financial benefits to needy artisans and craftsmen. The "Hunar Haat" is available on virtual and online platform http://hunarhaat.org and on GeM Portal also where the people of the country and abroad can buy products of indigenous artisans and craftsmen digital/online.

42. Which one of the following is NOT correct pair of Author-Book published in the year 2020 ?

(a) Arundhati Roy : Azadi

(b) Jairam Ramesh : A Chequered Brilliance

(c) Zadie Smith : Intimations

(d) Diane Cook : One Arranged Murder

42. Ans: (d)

Sol:

(a) **Azadi:** Freedom. Fascism. Fiction. by Arundhati Roy

Azadi is Urdu for Freedom! and has become the rallying cry both for the Kashmiris against the Indian occupation as well as of millions in India against the rise of Hindu nationalism and the authoritarianism of the Modi government. She discusses the importance as well as the abuses of language in Indian politics; the attacks on Muslims and the way the government has not only disenfranchised them but encouraged physical attacks against them; the situation in Kashmir and how the government has tried to shut down any communication with the rest of the world; the caste and class systems; and, in the last essay, the pandemic and how it is being handled by the Modi government. She also explains how so many of these issues have influenced her fiction.

Source: https://books.google.co.in/books/about/AZADI.html?id=w3QDwAAQBAJ&source=kp_book_description&redir_esc=y

(b) **A Chequered Brilliance:** The Many Lives of V.K. Krishna Menon – Jairam Ramesh

This is a compelling biography of one of India's most controversial and consequential public figures. V.K. Krishna Menon continues to command our attention not just because he was Jawaharlal Nehru's confidant and soulmate but also for many of his own political and literary accomplishments. A relentless crusader for Indian independence in the UK in the 1930s and 1940s, he was a global star at the United Nations in the 1950s before he was forced to resign as defence minister in the wake of the India-China war of 1962. Meticulously researched and based entirely on new archival material, this book reveals Krishna Menon in all his capabilities and contradictions. It is also a rich history of the tumultuous times in which he lived and which he did so much to shape.

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Source: https://books.google.co.in/books/about/A_Chequered_Brilliance.html?id=Q-bEDwAAQBAJ&source=kp_book_description&redir_esc=y

(c) Intimations is a 2020 collection of essays by writer Zadie Smith. Smith began writing the book around the time the COVID-19 pandemic began in the United States, and completed it soon after the murder of George Floyd. The essays discuss topics including creative writing, the pandemic, and the killing of George Floyd.

Source: https://www.goodreads.com/book/show/53825991-intimations

(d) One Arranged Murder is the ninth novel and the twelfth book overall written by the Indian author Chetan Bhagat. The novel is the sequel to Bhagat's 2018 novel The Girl in Room 105.

43. Which one of the following statements is NOT correct regarding the National Education Policy 2020 in India ?

(a) It proposes sweeping changes in the education system from pre-primary to PhD and skill development

(b) It states that universities from among top 100 in the world will be able to set up campuses in India.

(c) It expects that India will achieve 60% GER by 2030

(c) It suggests NAAC to be merged with UGC and AICTE

43. Ans: (c)

Sol:

- NEP 2020 aims for universalization of education from pre-school to secondary level with 100 % Gross Enrolment Ratio (GER) in school education by 2030.
- Gross Enrolment Ratio in higher education to be raised to 50 % by 2035.
- It emphasizes setting up of Gender Inclusion Fund, Special Education Zones for disadvantaged regions and groups.

Source: https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf

44. According to the National Institutional Ranking Framework 2020, which institute was on the top in overall ranking?

(a) Indian Institute of Technology, Madras

(b) Indian Institute of Science, Bengaluru

(c) Indian Institute of Technology, Delhi

(d) Indian Institute of Technology, Bombay

44. Ans: (a)

Sol:

The National Institutional Ranking Framework is a methodology adopted by the Ministry of Education, Government of India, to rank institutions of higher education in India. The disciplines covered are

- Engineering
- Management
- Pharmacy
- Medical
- Architecture
- Law
- Universities
- Colleges

Institution Name	City	Rank
Indian Institute of Technology Madras	Chennai	1
Indian Institute of S cience	Bengaluru	2
Indian Institute of Technology Delhi	New Delhi	3

45. Consider the following statements about ingenuity:
1. It is man's decades-long quest to fly a helicopter on Mars.
2. It is 0.6 metres tall and weight less than 1.8 kg.
3. It aims to look for habitability.

Which of the above statements is/are correct?

(a) 3 only (b) 1, 2 and 3
(c) 1 and 2 only (d) 2 only

45. Ans: (c)

Sol: The Mars Helicopter, Ingenuity, is a small, robotic helicopter operating on Mars attached to the belly of the Perseverance rover. Its mission is experimental in nature and completely independent of the rover's science mission. The project is solely a demonstration of technology; it is not designed to support the Mars 2020/Perseverance mission, which is searching for signs of ancient life and collecting samples of rock and sediment in tubes for potential return to Earth by later missions.

Dimensions :

Fuselage (body): 13.6 cm × 19.5 cm × 16.3 cm (5.4 in × 7.7 in × 6.4 in)

Landing legs: 0.384 m (1 ft 3.1 in)

Diameter Rotors: 1.2 m (4 ft)

Height : 0.49 m (1 ft 7 in)

Landing mass Total: 1.8 kg (4.0 lb)[1][3]

Batteries: 273 g (9.6 oz)

Power : 350 watts

46. Name the NASA astronaut who after setting the record of 328-day stay on the International Space Station (ISS), returned through Earth's atmosphere and landed on the Kazakhstani desert on 6th Feb 2020

(a) Josh Cassada (b) Jeanette Epps
(c) Christina Koch (d) Peggy Whitson

46. Ans: (c)

Sol: Christina Hammock Koch was selected as an astronaut by NASA in 2013. She completed astronaut candidate training in 2015. Koch graduated from North Carolina State University with a Bachelor of Science in Electrical Engineering and Physics and a Master of Science in Electrical Engineering. She most recently served as flight engineer on the International Space Station for Expedition 59, 60 and 61. Koch set a record for the longest single spaceflight by a woman with a total of 328 days in space.

47. The Thirteenth Meeting of the Conference of the Parties to the Convention on the Conservation of Migratory Species of Wild Animals (CMS COP 13) in 2020 was held in

(a) Brazil (b) India
(c) Indonesia (d) Canada

47. Ans: (b)

Sol: India has hosted 13th conference of parties (LOP) of convention on the conservation of migratory species fo wild animals. From 17th to 22nd February 2020 at gandhi nagar in Gujarath.

48. Consider the following statements with respect to the schemes initiated by the Government of India in 2020.
1. NISHTHA is a teachers training program
2. SVANidhi is a scheme to facilitate artisans to access affordable working capital loan.
3. SATYABHAMA is a scheme to promote research and development in science and technology.
4. Manodarpan is a scheme to promote tourism in rural parts of India.

Which of the above statements is / are correct?

(a) 1and 3 only (b) 2 and 4 only
(c) 3 and 4 only (d) 2 only

48. Ans: (a)

Sol:

1. NISHTHA is a capacity building programme for "Improving Quality of School Education through Integrated Teacher Training". It aims to build competencies among all the teachers and school principals at the elementary stage. NISHTHA is the world's largest teachers' training programme of its kind.The basic objective of this massive training programme is to motivate and equip teachers to encourage and foster critical thinking in students.

   Source: https://www.india.gov.in/spotlight/nishtha
2. SVANidhi - Ministry of Housing & Urban Affairs launched a scheme PM Street Vendor's AtmaNirbhar Nidhi (PM SVANidhi) to empower Street Vendors by not only extending loans to them, but also for their holistic development and economic upliftment. The scheme intends to facilitate collateral free working capital loans of up to INR10,000/- of one-year tenure, to approximately 50 lakh street vendors, to help resume their businesses in the urban areas, including surrounding peri-urban/rural areas.

   Source: https://www.india.gov.in/spotlight/pm-street-vendors-atmanirbhar-nidhi-pm-svanidhi
3. SATYABHAMA (Science and Technology Yojana for Aatmanirbhar Bharat in Mining Advancement) Portal for Science and Technology Programme Scheme of Ministry of Mines on 15th June 2020.

   Source: https://www.pib.gov.in/PressReleseDetail.aspx?PRID=1632668
4. The Ministry of Human Resources Development (MHRD) has launched the 'Manodarpan' initiative under Atmanirbhar Bharat Abhiyan. It is aimed to provide psychosocial support to students, family members and teachers for their mental health and well-being during the times of Covid-19.

   Source: http://manodarpan.mhrd.gov.in/

49. Which iconic figure set a Guinness World Record in 2020 for receiving 1 million followers for debut on Instagram in just 4 hours and 44 minutes?

    (a) Bong Joon-ho (b) Amy Coney Barrett

    (c) David Attenborough (d) Sanna Marin

49. Ans: (c)

Sol: Sir David Frederick Attenborough is an English broadcaster and natural historian. The veteran broadcaster's first post -- a video warning about climate change -- gained him one million followers in what was a record four hours and 44 minutes, according to Guinness World Records. Currently he has quit instagram.

50. Which one of the following statements is NOT correct about the Atal Tunnel?

    (a) It is the highest altitude tunnel in the world

    (b) It was inaugurated on 03 October 2020 in Rohtang

    (c) It connects Manali to Lahaul-Spitivalley

    (d) It is capable of handling 5000 cars and 2500 trucks per day with maximum speed of 80 kmph

50. Ans: (d)

Sol: Prime Minister Narendra Modi inaugurated on October 3rd, 2020, Atal Tunnel in Rohtang, which is the highest altitude tunnel in the world and has strategic significance.

A few facts about this engineering marvel

1. The 9.02 km long tunnel connects Manali to Lahaul-Spiti valley throughout the year.
2. The tunnel is built with ultra-modern specifications in the Pir Panjal range of Himalayas at an altitude of 3000 metres (10,000 feet) from the Mean Sea Level (MSL).
3. It is horseshoe-shaped, single tube double lane tunnel with a roadway of 8 metres.

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4. Atal Tunnel has been designed for traffic density of 3000 cars per day and 1,500 trucks per day with max speed of 80 km/hr. It has the state of the art electromechanical system including semi transverse ventilation system.

51. Who received the prestigious Abel Prize for the year 2020?
(a) Eric Adelberger and Blayne Heckel
(b) Hillel Furstenberg and Gregory Margulis
(c) Yvonne Farrell and Shelley McNamara
(d) Nia Holden and Lisa Piccirillo

51. Ans: (b)

Sol: About the Abel Prize

The Abel Prize recognizes outstanding scientific work in the field of mathematics, including mathematical aspects of computer science, mathematical physics, probability, numerical analysis and scientific computing, statistics, and also applications of mathematics in the sciences.

The Norwegian Academy of Science and Letters has decided to award the Abel Prize for 2020 to Hillel Furstenberg Hebrew University of Jerusalem, Israel, and Gregory Margulis Yale University, New Haven, CT, USA "for pioneering the use of methods from probability and dynamics in group theory, number theory and combinatorics."

52. Select the incorrect pair of the 2020 Nobel Prize Winners wih their respective areas of contribution:
(a) Louise Gluck - Literature
(b) Andrea Ghez - Physics
(c) Jennifer A. Doudna - Chemistry
(d) Harvey J. Alter - Economic Sciences

52. Ans: (d)

Sol:

FIELD	NOBEL LAUREATES	CONTRIBUTION
Medicine	Harvey J. Alter Michael Houghton Charles M. Rice	Discovered Hepatitis C virus
Physics	Roger Penrose	Discovered that black hole formation is a robust prediction of the general theory of relativity
	Reinhard Genzel Andrea Ghez	Discovered supermassive compact object at the centre of our galaxy
Chemistry	EmmanuelleCharpentier Jennifer A. Doudna	Discovered the method for genome editing using CRISPR Cas9

Literature	Louise Glück	Her unmistakable poetic voice that with austere beauty makes individual existence universal
Peace	World Food Programme (WFP)	Its efforts to combat hunger, bettering conditions for peace in conflict-affected areas and for acting as a driving force in efforts to prevent the use of hunger as a weapon of war and conflict.
Economic Sciences	Paul R. Milgrom Robert B. Wilson	Improvements in auction theory and inventions of new auction formats.

53. What is the angle between the hour hand and minute hand of a clock at 3:30 ?

(a) 105° (b) 180°

(c) 75° (d) 90°

53. Ans: (c)

Sol:

$$\theta = \left|30H - \frac{11m}{2}\right|$$

$$\theta = \left|30 \times 3 - \frac{11 \times 30}{2}\right|$$

$$\theta = |90 - 165|$$

$$\theta = 75°$$

54. Sun of the series $2^2+4^2+6^2+.....+20^2$ is

(a) 1040 (b) 1540

(c) 2540 (d) 3080

54. Ans: (b)

Sol:

$$2^2 + 4^2 + 6^2 + ...+20^2$$

$$= 2^2 (1^2 + 2^2 + 3^2 + ...10^2)$$

$$= 4\left(\frac{10 \times (10+1) \times (20+1)}{6}\right)$$

$$= \frac{4 \times 10 \times 11 \times 21}{6} = 1540$$

55. If A X B mens $(A^2 + B^2)$, then the value of 5 X (4X3) is

(a) 60 (b) 300

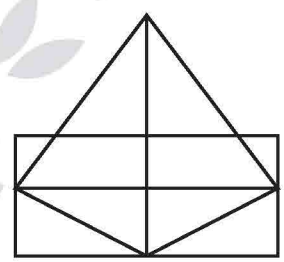
(c) 650 (d) 710

55. Ans: (c)

Sol: $4 \times 3 = 4^2 + 3^2 = 25$

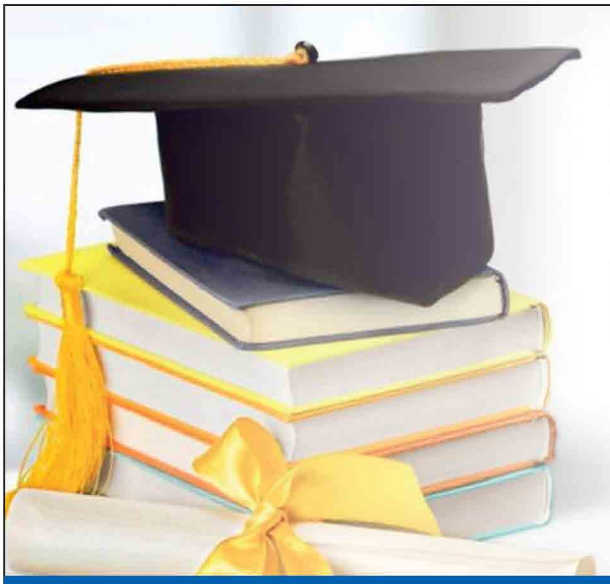
$5 \times (4 \times 3) = 5 \times 25 = 5^2 + 25^2 = 650$

56. The number of triangles in the given figure is diagram



(a) 11 (b) 13

(c) 15 (d) 17



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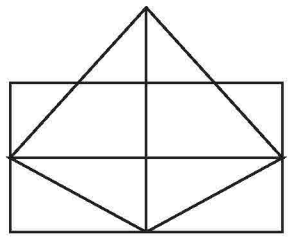
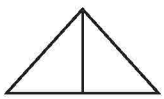
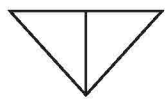
56. Ans: (c)

Sol:



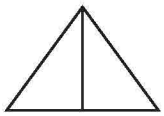


3 triangles



3 triangles

4 triangles



3 triangles

2 triangles

Total = 3 + 3 + 4 + 3 + 2 = 15 traingles

57. Statement 1 : A has more coins than B.
Statement 2: B has fewer coins than C.
Statement 3: C has fewer coins than A.
If the statement 1 is true and statement 2 is false, then the statement 3 is

(a) True (b) False
(c) Uncertain (d) Insufficient data

57. Ans: (a)

Sol: A has more coins than (B)
A > B
Given statement B has fewer coins than (C) which is wrong
B ≥C
A> B ≥ C
A > C
So 'C' has fewer coin than (A)

58. If $\frac{x+y}{x-1}=\frac{a}{b}$ and $\frac{1-y}{1+y}=\frac{b}{a}$, , then the value of $\frac{x-y}{1+xy}$ is

(a) $\frac{2ab}{a^2-b^2}$ (b) $\frac{a^2-b^2}{2ab}$
(c) $\frac{a^2+b^2}{2ab}$ (d) $\frac{a^2-b^2}{ab}$

58. Ans:(a)

Sol: Method 1

$\frac{x+1}{x-1}=\frac{a}{b}$ and $\frac{1-y}{1+y}=\frac{b}{a}$

Using componendo and dividendo

$x=\frac{a+b}{a-b}, y=\frac{a-b}{a+b}$

So, $\frac{x-y}{1+xy}=\frac{\left(\frac{a+b}{a-b}\right)-\left(\frac{a-b}{a+b}\right)}{1+\left(\frac{a+b}{a-b}\right)\left(\frac{a-b}{a+b}\right)}$

$=\frac{(a+b)^2-(a-b)^2}{2(a^2-b^2)}$

$=\frac{2ab}{a^2-b^2}$

59. If (2x + 3y) : (3x+5y) = 18 : 29, then the value of x : y is

(a) 4 : 1 (b) 4 : 5
(c) 3 : 4 (d) 3 : 1

59. Ans: (c)

Sol: $\frac{2x+3y}{3x+5y}=\frac{18}{2a}$

$\Rightarrow \frac{\frac{2x}{y}+3}{\frac{3x}{y}+5}=\frac{18}{2a}$

$\Rightarrow \frac{5\delta x}{y}+87=\frac{54x}{y}+90$

$\Rightarrow \frac{4x}{y}=3 \Rightarrow \frac{x}{y}=\frac{3}{4}$

x : y = 3 : 4

60. A is twice as good a workman as B and together, they finish a piece of work in 18 days. In how many days will A alone finish the work?
(a) 28 days (b) 30 days
(c) 27 days (d) 29 days

60. Ans: (c)
Sol: Work = $18 \times 3 = 54$ units
A - 2 u/d
B - 1 u/d
A + B – 18 days 2+1 = 3 u/d
Time taken by A alone = $\frac{54}{2} = 27$

61. In how many years will a sum of ₹ 800 at 10% per annum compounded semi annually become ₹ 926.10?
(a) $1\frac{1}{3}$ years (b) $1\frac{1}{2}$ years
(c) $2\frac{1}{3}$ years (d) $2\frac{1}{2}$ years

61. Ans: (b)
Sol:
$$A = P\left(1+\frac{r}{100}\right)^n$$
$$926.10 = 800\left[1+\frac{5}{100}\right]^n$$
Interest become half, because half yearly 10% p.a
5% per 6 month
After simplification = 'n' become = 3
i.e $1\frac{1}{2}$ year

62. The diagonal of a rectangle is $\sqrt{41}$ cm and its area is 20 sq. cm. The perimeter of the rectangle is
(a) 9 cm (b) 18 cm
(c) 20 cm (d) 41 cm

62. Ans: (b)
Sol:
The diagonal of rectangle (d) = $\sqrt{41}$
$$\sqrt{\ell^2+b^2} = \sqrt{41}$$
$$\ell^2 + b^2 = 41$$
Area (ℓ b) = 20
So, $(\ell+b)^2 = \ell^2 + b^2 + 2\ell b$
$= 41 + 2(20) = 81$
$\ell + b = 9$
Perimeter of the rectangle = $2(\ell + b) = 2(9) = 18$

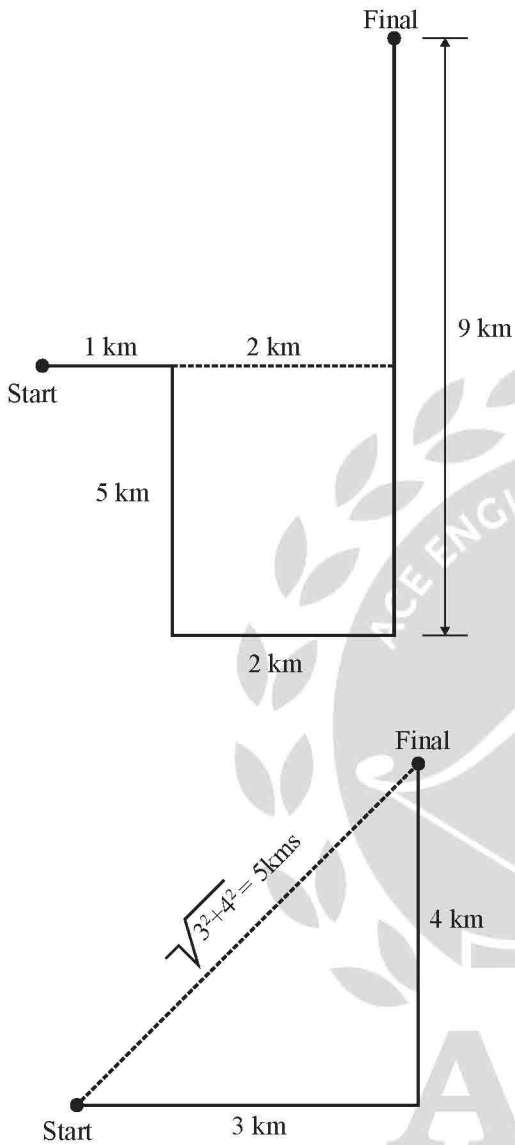
63. Four persons are chosen at random from a group of 3 men, 2 women and 4 children. The change that exactly 2 of them are children, is
(a) $\frac{2}{9}$ (b) $\frac{4}{5}$
(c) $\frac{7}{12}$ (d) $\frac{10}{21}$

63. Ans: (d)
Sol:
We need, two children must out of 4-children
$\Rightarrow 4_{C2}$
we have to pick - 4 members
$\Rightarrow$ (3m + 2w) = 5 persons
$$\frac{5_{C_2}\times 4_{C_2}}{9_{C_4}} \Rightarrow \frac{\frac{5\times4}{2}\times\frac{4\times3}{2}}{\frac{9\times8\times7\times6}{1\times2\times3\times4}} \Rightarrow \frac{10}{21}$$

64. A man walks 1 km to East and then he turns to South and walks 5 km. Again, he turns to East and walks 2 km. After, he turns to North and walks 9 km. Now, how far he is from his station point?
(a) 3 km (b) 4 km
(c) 5 km (d) 7 km

64. Ans: (c)

Sol:



65. The population of a village is 5500. If the number of males increases by 11% and the number of females increases by 20% then the population becomes 6330. The population of female in the village is

(a) 2000 (b) 2500

(c) 3000 (d) 3500

65. Ans: (b)

Sol: Method 1

$M + F = 5500 \quad \rightarrow (1)$

$1.11\% M + 1.20\% F = 6330$

$111 M + 120 F = 6330 \quad \rightarrow (2)$

Solving (1) and (2)

We get $f = 2500$

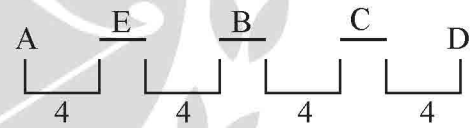
66. A, B, C, D and E are five different integers. When written in the ascending order of values, the difference between any two adjacent integers is 4. D is the greatest and A is the least. B is greater than E but less than C. The sum of the integers is equal to E. What is the positive difference between the lowest and the highest integers?

(a) 8 (b) 6

(c) 16 (d) 18

66. Ans: (c)

Sol:



$D - A = 16$

67. Mary introduces Jack as the son of the only daughter of my father's wife. How is Jack related to Mary?

(a) Brother (b) Son

(c) Husband (d) Father

67. Ans: (b)

Sol: Mary (woman) said,

"Only daughter of my father's wife"

Mary

So, Mary introduces Jack as the son of Mary

68. The value of $\int_0^1 \int_0^x (x^2+y^2)dA$, dA, where dA indicates small area in xy-plane, is

(a) $\frac{1}{2}$ sq. units (b) $\frac{1}{3}$ sq. units

(c) $-\frac{1}{2}$ sq. units (d) $-\frac{1}{3}$ sq. units

68. Ans: (b)

Sol: Let $I = \int_{x=0}^{1}\left[\int_{y=0}^{x}(x^2+y^2)dy\right]dx$, where dA = dxdy

Then $I = \int_{x=0}^{1}\left(x^2y+\frac{y^3}{3}\right)_0^x dx$

$\Rightarrow I = \int_{x=0}^{1}\left(x^3+\frac{x^3}{3}\right)dx$

$\Rightarrow \left(\frac{x^4}{4}+\frac{x^4}{12}\right)_0^1$

$\therefore \quad I = \frac{1}{4}+\frac{1}{12} = \frac{3+1}{12} = \frac{4}{12} = \frac{1}{3}$ sq.units

69. If $x = uv$, $y = \frac{u+v}{u-v}$, then $\frac{\partial(u,v)}{\partial(x,y)}$ is

(a) $\frac{(u-v)^2}{4uv}$ (b) $\frac{(u+v)^2}{4uv}$

(c) $\frac{(u-v)}{4\,uv}$ (d) $\frac{(u+v)}{4\,uv}$

69. Ans: (A)

Sol: Given $x = uv$ and $y = \frac{u+v}{u-v}$

$\Rightarrow \frac{\partial x}{\partial u} = v, \frac{\partial x}{\partial v} = u,$

$\frac{\partial y}{\partial u} = \frac{(u-v)-(u+v)}{(u-v)^2} = \frac{-2v}{(u-v)^2}$

and $\frac{\partial y}{\partial v} = \frac{(u-v)-(u+v)(-1)}{(u-v)^2} = \frac{2u}{(u-v)^2}$

Now, $\frac{\partial(x,y)}{\partial(u,v)} = \begin{vmatrix} \frac{\partial x}{\partial u} & \frac{\partial x}{\partial v} \\ \frac{\partial y}{\partial u} & \frac{\partial y}{\partial v} \end{vmatrix}$

$\Rightarrow \frac{\partial(x,y)}{\partial(u,v)} = \begin{vmatrix} v & u \\ \frac{-2v}{(u-v)^2} & \frac{2u}{(u-v)^2} \end{vmatrix} = \frac{2uv}{(u-v)^2}+\frac{2uv}{(u-v)^2}$

$\Rightarrow \frac{\partial(x,y)}{\partial(u,v)} = \frac{4uv}{(u-v)^2}$

$\because \quad \frac{\partial(x,y)}{\partial(u,v)}\cdot\frac{\partial(u,v)}{\partial(x,y)} = 1$

$\therefore \frac{\partial(u,v)}{\partial(x,y)} = \frac{1}{\frac{\partial(x,y)}{\partial(u,v)}} = \frac{(u-v)^2}{4uv}$

70. If $u = x^3 + y^3$ where $x = a\cos t$, $y = b \sin t$, then $\frac{du}{dt} =$

(a) $-3a^3\cos^2 t\sin t + 3b^3\sin^2 t\cos t$

(b) $3a^3\sin^2 t\cos t + 3b^3\cos^2 t\sin t$

(c) $3b\sin^2 t\cos t + 3a^3\sin^2 t\cos t$

(d) $-3a^3\sin t + 3b^3\cos^2 t\sin t$

70. Ans: (a)

Sol: Given $u = x^3 + y^3$, where $x = a\cos t$ and $y = b\sin t$

Now, $\frac{du}{dt} = \frac{\partial u}{\partial x}\frac{dx}{dt}+\frac{\partial u}{\partial y}\frac{dy}{dt}$

$\Rightarrow \frac{du}{dt} = (3x^2)(-a\sin t)+(3y^2)(b\cos t)$

$\Rightarrow \frac{du}{dt} = (-3a)(a^2\cos^2 t)(\sin t)+(3b)(b^2\sin^2 t)(\cos t)$

$\therefore \quad \frac{du}{dt} = -3a^3\cos^2(t).\sin(t)+3b^3\sin^2(t)\cos(t)$

71. Suppose that a book of 600 pages contains 40 printing mistakes. Assume that these errors are randomly distributed throughout the book and x, the number of errors per page has a Poisson distribution. What is the probability that 10 pages selected at random will be free of errors?

(a) $\frac{1}{3}e^{-1}$ (b) $2e^{-\frac{1}{3}}$ (c) $e^{-\frac{2}{3}}$ (d) $\frac{1}{3}e^{-2}$

71. Ans: (c)

72. The highest Eigen value of the 2×2 matrix $\begin{bmatrix}1 & 2\\ 4 & 3\end{bmatrix}$ is

(a) –1 (b) –5

(c) 5 (d) 1

72. Ans: (c)

Sol:

Given $A = \begin{bmatrix}1 & 2\\ 4 & 3\end{bmatrix}$

Consider the characteristic equation of $A_{2\times2}$ matrix $|A - \lambda I| = 0$

$\Rightarrow \begin{vmatrix}1-\lambda & 2\\ 4 & 3-\lambda\end{vmatrix} = 0$

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

$\Rightarrow \lambda = 1, 5$ given eigen values of a given matrix $A_{2\times2}$

$\therefore$ The highest eigen value of a given 2×2 matrix A is 5.

73. If $\Delta = \begin{vmatrix}p & p^2 & (p^3-1)\\ q & q^2 & (q^3-1)\\ r & r^2 & (r^3-1)\end{vmatrix} = 0$ in which p, q, r are different.

The value of pqr is

(a) 3 (b) 1

(c) 2.5 (d) 3.5

73. Ans: (B)

Sol: Given that $\Delta = \begin{vmatrix}p & p^2 & (p^3-1)\\ q & q^2 & (q^3-1)\\ r & r^2 & (r^3-1)\end{vmatrix} = 0$

$\Rightarrow \begin{vmatrix}p & p^2 & p^3\\ q & q^2 & q^3\\ r & r^2 & r^3\end{vmatrix} + \begin{vmatrix}p & p^2 & -1\\ q & q^2 & -1\\ r & r^2 & -1\end{vmatrix} = 0$

$\Rightarrow p.q.r\begin{vmatrix}1 & p & p^2\\ 1 & q & q^2\\ 1 & r & r^2\end{vmatrix} + \begin{vmatrix}p & p^2 & -1\\ q & q^2 & -1\\ r & r^2 & -1\end{vmatrix} = 0$

$\Rightarrow p.q.r\begin{vmatrix}1 & p & p^2\\ 1 & q & q^2\\ 1 & r & r^2\end{vmatrix} - \begin{vmatrix}-1 & p^2 & p\\ -1 & q^2 & q\\ -1 & r^2 & r\end{vmatrix} = 0$

$\Rightarrow pqr\begin{vmatrix}1 & p & p^2\\ 1 & q & q^2\\ 1 & r & r^2\end{vmatrix} + \begin{vmatrix}-1 & p & p^2\\ -1 & q & q^2\\ -1 & r & r^2\end{vmatrix} = 0$

$\Rightarrow pqr\begin{vmatrix}1 & p & p^2\\ 1 & q & q^2\\ 1 & r & r^2\end{vmatrix} - \begin{vmatrix}1 & p & p^2\\ 1 & q & q^2\\ 1 & r & r^2\end{vmatrix} = 0$

$\Rightarrow \begin{vmatrix}1 & p & p^2\\ 1 & q & q^2\\ 1 & r & r^2\end{vmatrix}(pqr-1) = 0$

$\Rightarrow (pqr-1) = 0$ (or) $\begin{vmatrix}1 & p & p^2\\ 1 & q & q^2\\ 1 & r & r^2\end{vmatrix} = 0$

$\therefore$ pqr = 1

74. If $A = \begin{bmatrix}-1 & 2 & 3 & -2\\ 2 & -5 & 1 & 2\\ 3 & -8 & 5 & 2\\ 5 & -12 & -1 & 6\end{bmatrix}$, then the rank of the matrix A is

(a) 2 (b) 5

(c) 4 (d) 3

74. Ans: (A)

Sol: Given $A = \begin{bmatrix}-1 & 2 & 3 & -2\\ 2 & -5 & 1 & 2\\ 3 & -8 & 5 & 2\\ 5 & -12 & -1 & 6\end{bmatrix}$

$R_2 \to 2R_1 + R_1; R_3 \to R_3 + 3R_1; R_4 \to R_4 + 5R_1$

$\Rightarrow A \sim \begin{bmatrix}-1 & 2 & 3 & -2\\ 0 & -1 & 7 & -2\\ 0 & -2 & 14 & -4\\ 0 & -2 & 14 & -4\end{bmatrix}$

$R_3 \to R_3 - 2R_2; R_4 \to R_4 - 2R_2$

$$\Rightarrow A \sim \begin{bmatrix} -1 & 2 & 3 & -2 \\ 0 & -1 & 7 & -2 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$\therefore$ The rank of a given matrix $A_{4\times4}$ is 2.

75. If $A = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 0 & -1 \\ 1 & 2 & 3 \end{bmatrix}$, then which one of the following is correct?

(a) $A^3 - 3A^2 - 4A + 11I = 0$

(b) $A^3 - 4A^2 - 3A + 11I = 0$

(c) $A^3 + 4A^2 - 3A + 11I = 0$

(d) $A^3 - 3A^2 - 4A + 11I = 0$

75. Ans: (b)

Sol: Given $A = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 0 & -1 \\ 1 & 2 & 3 \end{bmatrix}$

$\Rightarrow$The characteristic equation of a given matrix $A_{3\times3}$ is given by $|A - \lambda I| = 0$

$$\Rightarrow \lambda^3 - (1 + 0 + 3)\lambda^2 + \{(-6) + (2) + (1)\}\lambda - (-11) = 0$$

$$\Rightarrow \lambda^3 - 4\lambda^2 - 3\lambda + 11 = 0$$

$\therefore$ By cayley Hamilton theorem, we have

$$A^3 - 4A^2 - 3A + 11I = O$$

76. The Maclaurin's series expansion of $e^{\sin x}$ is

(a) $1 + x - \frac{x^2}{2} + \frac{x^4}{12} - \ldots.$

(b) $1 - x + \frac{x^2}{2} - \frac{x^4}{8} + \ldots.$

(c) $1 + x + \frac{x^2}{2} - \frac{x^4}{8} + \ldots.$

(d) $1 + x + \frac{x^2}{2} - \frac{x^4}{12} + \ldots.$

76. Ans: (c)

Sol: Let $f(x) = e^{\sin(x)}$

Then the maclaurin series expansion of f(x) is given by

$$f(x) = f(0) + x.f'(0) + \frac{x^2}{2!}f''(0) + \frac{x^3}{3!}f'''(0) + \frac{x^4}{4!}f^{iv} + \ldots. \text{①}$$

Consider, $f(x) = e^{\sin(x)}$ and $f(0) = e^0 = 1$

$$\Rightarrow f'(x) = e^{\sin x}.\cos x \text{ and } f'(0) = e^0 = 1$$

$$\Rightarrow f''(x) = e^{\sin x}\cos^2(x) + e^{\sin x}(-\sin x) = e^{\sin x}[\cos^2(x) - \sin(x)]$$

and $f''(0) = e^0(1 - 0) = 1$

$$\Rightarrow f'''(x) = e^{\sin x}\cos(x)[\cos^2(x) - \sin(x)] + e^{\sin x}[-2\cos x \sin x - \cos x]$$

$$= e^{\sin x}\left[\cos^3(x) - \frac{1}{2}\sin(2x)\right] - e^{\sin x}[\sin(2x) + \cos x]$$

and $f'''(0) = e^0[1 - 0] - e^0[0 + 1] = 0$

$$\Rightarrow f^{iv}(x) = e^{\sin x}.\cos(x)\left[\cos^3(x) - \frac{1}{2}\sin(2x)\right] + e^{\sin x}[3\cos^2(x)(-\sin x) - \cos(2x)] - e^{\sin x}\cos(x)[\sin(2x) + \cos x] - e^{\sin x}(2\cos(2x) - \sin x)$$

and $f^{iv}(0) = e^0(1 - 0) - e^0(0 - 1) - e^0(0 + 1) - e^0(2 - 0) = -3$

Substituting above all in (1), we get

$$f(x) = (1) + (x)(1) + \left(\frac{x^2}{2!}\right)(1) + \left(\frac{x^3}{3!}\right)(0) + \left(\frac{x^4}{4!}\right)(-3) + \ldots.$$

$$\therefore e^{\sin(x)} = 1 + x + \frac{x^2}{2} - \frac{x^4}{8} + \ldots\ldots$$

correct option is (c)

77. The real root of $x^3 + x^2 + 3x + 4 = 0$ correct to four decimal places, obtained using Newton Raphson method is

(a) -1.3334 (b) 1.3221

(c) -1.2229 (d) 1.2929

77. Ans: (c)

Sol: Let $f(x) = x^3 + x^2 + 3x + 4$

then $f'(x) = 3x^2 + 2x + 3$

Here, $f(0) = 4 > 0$

$f(-1) = 1 > 0$

$f(-2) = -6 < 0$

$\therefore$ The required root lies between -1 and -2

First iteration

Let $x_0 = -1$ be the initial approximation

Then $f(x_0) = f(-1) = 1$

and $f'(x_0) = 4$

$$\text{Now, } x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$

$$\Rightarrow x_1 = (-1) - \frac{(1)}{4}$$

$$\therefore x_1 = \frac{-5}{4} = -1.25$$

Second Iteration

Here, $f(x_1) = f(-5/4) = f(-1.25) = -0.1406$

and $f'(x_1) = f'(-5/4) = f'(-1.25) = 5.1875$

$$\text{Now, } x_2 = x_1 - \frac{f(x_1)}{f'(x_1)}$$

$$\Rightarrow x_2 = (-1.25) - \frac{(-0.1406)}{(5.1875)}$$

$\therefore x_2 = -1.2229$ is a required approximation

correct option is (c)

78. The value of $\int_0^6 \frac{dx}{1+x^2}$ by Simpson is $\frac{1}{3}$ rule is

(a) 1.3111 (b) 1.3941

(c) 1.3735 (d) 1.3662

78. Ans: (d)

Sol:

Let $\int_a^b f(x)dx = \int_0^6 \frac{1}{1+x^2}dx$ and $h = 1$

Then $a = 0$, $b = 6$ and $f(x) = \frac{1}{1+x^2}$

x	0	1	2	3	4	5	6
y=f(x)	1	0.5	0.2	0.1	0.0588	0.0385	0.027

he formula of simpson's 1/3rd rule is given by

$$\int_a^b f(x)dx \simeq \int_a^b p(x)dx = \frac{h}{3}[(y_o + y_6) + 2(y_2 + y_4) + 4(y_1 + y_3 + y_5)]$$

$$\Rightarrow \int_0^6 f(x)dx \simeq \int_0^6 p(x)dx = \frac{1}{3}[(1 + 0.027) + 2(0.2 + 0.0588)] + 4(0.5 + 0.1 + 0.0385)$$

$$\therefore \int_0^6 \frac{1}{1+x^2}dx \simeq \int_0^6 p(x)dx = 1.3662$$

79. The value of $\sum_1^n \frac{1}{(x+3)(x+4)}$ is

(a) $\frac{n}{n+2}$ (b) $\frac{2n}{n+1}$

(c) $\frac{n}{4(n+4)}$ (d) $\frac{n}{2(n+2)}$

79. Ans: (c)

Sol:

$$\text{Consider } \sum_{x=1}^n \frac{1}{(x+3)(x+4)} = \sum_{x=1}^n \left[\frac{1}{x+3} - \frac{1}{x+4}\right]$$

$$\Rightarrow \sum_{x=1}^n \frac{1}{(x+3)(x+4)} = \left[\frac{1}{4} - \frac{1}{5}\right] + \left[\frac{1}{5} - \frac{1}{6}\right] + \left[\frac{1}{6} - \frac{1}{7}\right] + \ldots\ldots + \left[\frac{1}{n+2} - \frac{1}{n+3}\right] + \left[\frac{1}{n+3} - \frac{1}{n+4}\right]$$

$$\Rightarrow \sum_{x=1}^n \frac{1}{(x+3)(x+4)} = \frac{1}{4} - \frac{1}{n+4}$$

$$\therefore \sum_{x=1}^n \frac{1}{(x+3)(x+4)} = \frac{(n+4)-4}{4(n+4)} = \frac{n}{4(n+4)}$$

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80. The surface which intersects the surfaces of the system $z(x+y) = c(3z+1)$ orthogonally and which passes through the circle $x^2+y^2=1, z=1$, is given by

(a) $x^2+y^2=2z^3+z^2-2$

(b) $x^2-y^2=z^3+z+1$

(c) $x^2-y^2=z^2+4$

(d) $x^2+y^2=z^3+z^2+4$

80. Ans: (a)

Sol: Given:

$z(x+y) = C(3z+1)$

$$\frac{z(x+y)}{(3z+1)} = C$$

Let $f = \frac{z(x+y)}{(3z+1)}$

$$\frac{\partial f}{\partial x} = \frac{z}{3z+1}, \frac{\partial f}{\partial y} = \frac{z}{3z+1}$$

$$\frac{\partial f}{\partial z} = \frac{(3z+1)(x+y)-3z(x+y)}{(3z+1)^2} = \frac{x+y}{(3z+1)^2}$$

$$\nabla f = \left(\frac{z}{3z+1}\right)\vec{i} + \left(\frac{z}{3z+1}\right)\vec{j} + \frac{(x+1)}{(3z+1)^2}\vec{k}$$

Let $z = f(x, y)$ be normal to the surface

$z(x+y) = C(3z+1)$

The outward normal vector to $f(x, y) - z = 0$

$$\vec{i}\frac{\partial f}{\partial x} + \vec{j}\frac{\partial f}{\partial y} + \vec{K}(-1) = \vec{i}p + \vec{j}q - \vec{K}$$

$$\Rightarrow \nabla f \cdot g = 0$$

$$\frac{pz}{3z+1} + \frac{qz}{3z+1} - \frac{(x+y)}{(3z+1)^2} = 0$$

$$\frac{pz}{3z+1} + \frac{qz}{3z+1} = \frac{(x+y)}{(3z+1)^2} \qquad \therefore (Pp + Qq = R)$$

The auxiallary equation is

$$\frac{dx}{\frac{z}{3z+1}} = \frac{dy}{\frac{z}{3z+1}} = \frac{dz}{\frac{(x+y)}{(3z+1)^2}}$$

$$\frac{dx}{\frac{z}{3z+1}} = \frac{dy}{\frac{z}{3z+1}} \Rightarrow dx = dy$$

$$\Rightarrow \int dx = \int dy$$

$$\Rightarrow x = y + C_1$$

$$\Rightarrow x - y = C_1$$

$u(x, y) = x-y)$

Now, $$\frac{dx}{\frac{z}{3z+1}} = \frac{dy}{\frac{z}{3z+1}} = \frac{dz}{\frac{(x+y)}{(3z+1)^2}}$$

$$\frac{dx}{\frac{z}{3z+1}} = \frac{dy}{\frac{z}{3z+1}} = \frac{z(3z+1)dz}{\frac{z(x+y)}{(3z+1)}}$$

$$\frac{dx}{1} = \frac{dy}{1} = \frac{z(3z+1)}{(x+y)}dz$$

$$dx = dy = \frac{(3z^2+z)}{(x+y)}dz \ldots\ldots (1)$$

$$\frac{xdx}{x} = \frac{ydy}{y} = \frac{(3z^2+z)}{(x+y)}dz$$

$$= \frac{xdx + ydy - (3z^2+z)dz}{x+y-(x+y)}$$

$$\Rightarrow xdx + ydy - (3z^2+z)dz = 0$$

$$\Rightarrow \frac{x^2}{2} + \frac{y^2}{2} - \left(z^3 + \frac{z^2}{2}\right) = C$$

$$\Rightarrow x^2 + y^2 - 2z^3 - z^2 = 2C = C_2$$

$x^2 + y^2 - 2z^3 - z^2 = C_2$

$x^2 + y^2 - 2z^3 - z^2 = \phi(C_1)$

$x^2 + y^2 - 2z^3 - z^2 = \phi\,(x - y)$

$1-2-1 = \phi(x-y)$

$\phi(x-y) = -2$

$\therefore$ The required surface is

$x^2 + y^2 = 2z^3 + z^2 - 2$

81. The surface area of that portion of the surface $z=\sqrt{4-x^2}$ that lies above rectangle R in the xy-plane whose co-ordinates satisfy $0 \le x \le 1$ and $0 \le y \le 4$ is equal to

(a) $4-\pi$ (b) $\frac{3}{4}\pi^2$

(c) $\frac{\sqrt{3}}{5}\pi$ (d) $\frac{4}{3}\pi$

81. Ans: (d)

Sol:

Given : $z=\sqrt{4-x^2}$

$$\Rightarrow \frac{\partial z}{\partial x}=\frac{-2x}{2\sqrt{4-x^2}}=\frac{-x}{\sqrt{4-x^2}}$$

and $\frac{\partial z}{\partial y}=0$

Required surface area is

$$S=\iint_s \sqrt{1+\left(\frac{\partial z}{\partial x}\right)^2+\left(\frac{\partial z}{\partial y}\right)^2}\,dxdy$$

$$=\iint_s \sqrt{1+\frac{x^2}{4-x^2}}\,dxdy$$

$$=\iint_s \sqrt{\frac{(4-x^2)+x^2}{4-x^2}}\,dxdy$$

$$=\iint_s \sqrt{\frac{4}{4-x^2}}\,dxdy$$

$$=2\int_{x=0}^{1}\int_{y=0}^{4}\frac{1}{\sqrt{4-x^2}}\,dxdy$$

$$=2(dy)_0^4\left(\sin^{-1}\left(\frac{x}{2}\right)\right)_0^1$$

$$=(2)(4)\left[\sin^{-1}\left(\frac{1}{2}\right)-\sin^{-1}(0)\right]$$

$$=(2)(4)\left[\frac{\pi}{6}\right]$$

$$=\frac{4\pi}{3}$$

82. The value of y at $x = 0.1$ to five places of decimals, by Taylor's series method, given that $\frac{dy}{dx}=x^2y-1$, $y(0) = 1$, is

(a) 0.68281 (b) 0.81122

(c) 0.90033 (d) 0.70127

82. Ans: (c)

Sol: Given

$$\frac{dy}{dx}=x^2y-1 \qquad \because \frac{dy}{dx}=y'=f(x,y)$$

with $y(0)=1 \quad \because y(x_0)=y_0$

Let $x_0=0$, $y_0=1$, $y'=f(x,y)=x^2y-1$ and $x_1=0.1$

Then

$h=x_1-x_0=0.1-0=0.1$

The taylor series method of order 3 is given by

$$y(x_1)\simeq y_1=y_0+\frac{h}{1!}y_0'+\frac{h^2}{2!}y_0''+\frac{h^3}{3!}y_0''' \quad ---\ (1)$$

Consider

$$y'=f(x,y)=x^2y-1 \quad \& \quad y_0'=f(x_0,y_0)=x_0^2y_0-1=-1$$

$$\Rightarrow y''=2xy+x^2y' \text{ and } y_0''=2x_0y_0+x_0^2y_0^1=0+0=0$$

$$\Rightarrow y'''=2y+2xy'+2xy'+x^2y'' \text{ and } y_0'''=2+0+0+0=2$$

Substituting above all in (1) , we get

$$y(0.1)\simeq y_1=(1)+(0.1)(-1)+\frac{(0.1)^2}{2!}(0)+\frac{(0.1)^3}{3!}$$

$$\Rightarrow y(0.1)\simeq y_1=1-0.1+0+\frac{(0.001)}{3}$$

$$\Rightarrow y(0.1)\simeq y_1=1-0.1+0.00033=1.00033-0.1$$

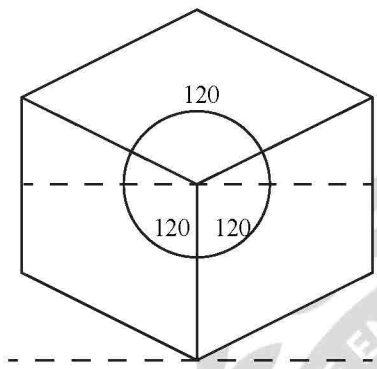
$$\therefore y(0.1)\simeq y_1=0.90033$$

83. In which one of the following projection types, the object is kept such a way that its three mutual perpendicular edges make equal angles with the plane of projection and the object stands on one of its corners?

(a) Non Isometric projection
(b) Oblique projection
(c) Isometric projection
(d) Point projection

83. Ans: (c)

Sol:



84. The creative design routes are practiced by adopting following steps:
1. Concentration
2. Illumination
3. Preparation
4. Verification
5. Incubation

Arrange the above steps in correct sequence:
(a) 3, 1, 5, 2, 4
(b) 3, 5, 2, 1, 4
(c) 3, 2, 1, 5, 4
(d) 3, 1, 2, 5, 4

84. Ans: (b)

Sol: The correct order is:

Preparation: The elements of the problem are examined and their interrelations are studied.

Incubation: You "sleep on the problem." Sleep disengages your conscious mind, allowing the unconscious mind to work on a problem freely.

Concentration: You think about the problem in a focused way to avoid distractions.

Illumination: A solution or a path toward the solution emerges.

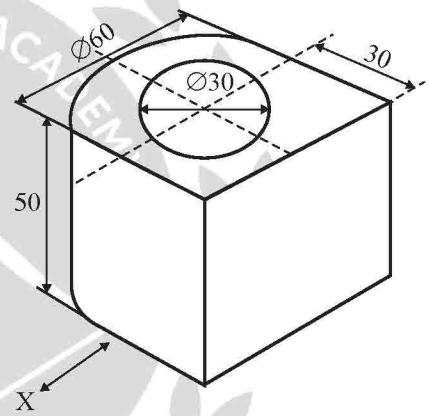
Verification: The inspired solution is checked against the desired result.

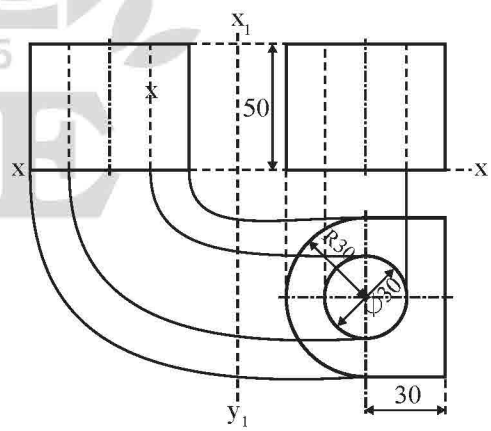
85. Points to be remembered while dimensioning:
1. Dimensions are to be placed on the view which clearly express the relevant features
2. Once dimension is marked in one view, it should not be repeated in another view
3. Dimensions are to be drawn from hidden lines
4. Dimensions should be given from the base line or centre line of a hole

Which of the above statements are correct?
(a) 1, 2 and 3 only
(b) 1, 2 and 4 only
(c) 1, 3 and 4 only
(d) 2, 3 and 4 only

85. Ans: (b)

Sol:





86. The design of highway interchanges involves the application of the geometry of
(a) circle arcs
(b) semi ellipse
(c) hyperbola
(d) semi-circle

86. Ans: (c)

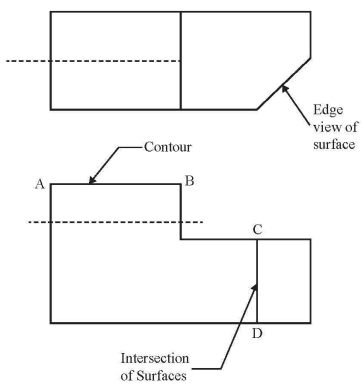
Sol: In design of highway interchanges, with hyperbole the entry and exist will be tangential to be path way, that is what required highway interchange.

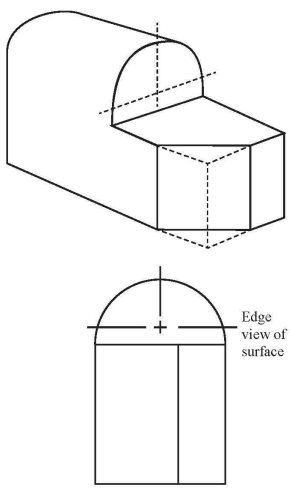
87. On a multi view drawing a visible or invisible line represents the following:
1. Intersection of two surfaces
2. Edge view of a surface
3. Limiting elements of a surface

Which of the above points are correct?
(a) 1 and 2 only (b) 2 and 3 only
(c) 1 and 3 only (d) 1, 2 and 3

87. Ans: (d)

Sol:

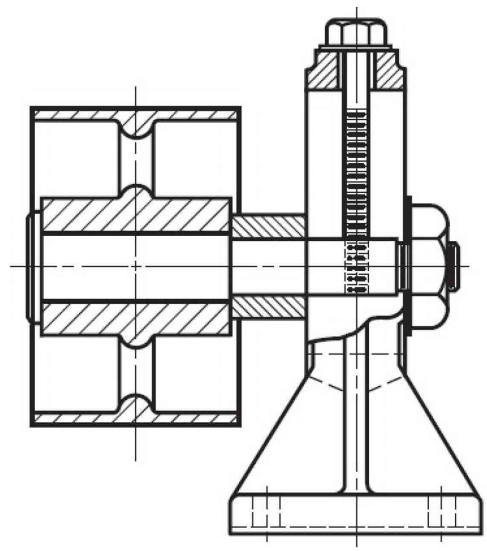




88. On a view showing assembled parts, section lines on adjacent pieces are drawn in
(a) same directions usually at an angle of 90°
(b) opposite directions usually at an angle of 45°
(c) opposite directions usually at an angle of 30°
(d) same directions usually at an angle of 60°

88. Ans: (b)

Sol: In assembled drawing the sectioned lines drawn on adjacent pieces are drawn in usually at 45° angle but opposite in direction.



89. Oblique drawing has the following advantage over isometric drawing:
(a) Distortion can be increased by foreshortening measurements along the receding axis
(b) A greater choice is permitted in orthographic top view
(c) Circular or irregular outlines on the front face show in their true shape
(d) Oblique drawing is often less flexible

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89. Ans: (c)

Sol: Oblique drawings can be defined as the projectors are parallel to each other but inclined to plane of projections and in case of oblique drawings the front view represents true dimensions or true shapes.
Here truely speaking oblique drawings are more flexible then that of other drawings.

90. Most of Deming's deadly diseases involve
(a) immobility of management
(b) a long term orientation
(c) a lack of understanding of variation
(d) high degree of constancy of purpose

90. Ans: (c)

Sol: Deming's Deadlg disease
Management by visible figures
Lack of constancy of purpose
Performance appraisal by number
Short term orientation
Mobility of management

91. Which one of the following rules is NOT used for identifying an out-of-control process?
(a) A process is assumed to be out-of control if a single point plots outside the control limits
(b) A process is assumed to be out-of control if there is a run of six or more consecutive points steadily increasing or decreasing
(c) A process is assumed to be out-of-control if nine or more consecutive points fall to one side of the centre line
(d) A process is assumed to be out-of-control if two or more consecutive points fall beyond the lσ limit on the same side of the centre line

91. Ans: (d)

Sol: Rules for identifying an out of control process.

- Rule 1:- A process is assumed to be out of control if a single point plots outside the control limits.
- Rule 2: A Process is assumed to be out of control if two out of three consecutive points fall outside the 26 warming limits on the same side of centerline.
- Rule 3: A process is assumed to be out of control if four out of five consecutive points fall beyond the 16 limit on the same side of centerline.
- Rule 4: A process is assumed to be out of control if nine or more consecutive points fall to one side of centreline.
- Rule 5: A process is assumed to be out of control if there is a run of six or more consecutive points steadily increasing or decreasing

92. Which one of the following is NOT a major quality control method?
(a) Inspection (b) Testing
(c) Loading (d) Sampling

92. Ans: (c)

Sol: Loading is a part of production planning & control

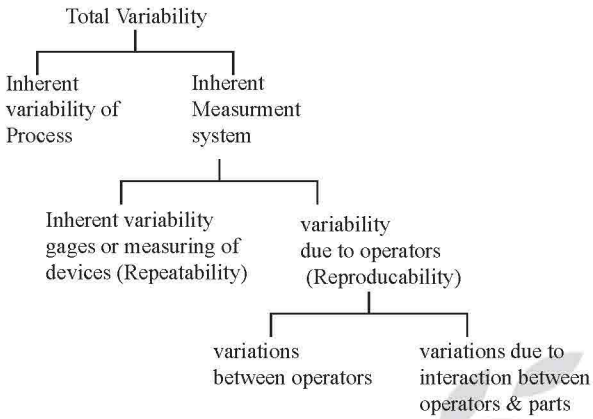
93. Which one of the following is the responsiveness to business issues in commercial performance?
(a) Frequency of over shipments
(b) Quotations
(c) Timely reconciliation of cumulative shipments
(d) Timely supplier response to problems

93. Ans: (d)

94. Which one of the following is NOT a component of total variability of measured observations?
(a) Variation between operators
(b) Variability due to operators
(c) Variability between parts dimensions
(d) Variation due to interaction between operators and parts.

94. Ans: (c)

Sol:



95. Which one of the following unique characteristics of the construction process makes TQM difficult to implement?
   (a) The construction process is relatively short in duration
   (b) A low percentage of the labour at a construction project only work for the construction firm for a short time period
   (c) Project owners take a long term view to control projects
   (d) Construction projects are multiple, each project being some what same

95. Ans: (b)

Sol: The work force in the construction industry tend to be transient and most of the work force of kamparany. The workers stay in the project place for a short period of time.

96. Rearrange the following steps involved in construction of pareto diagram in the proper order
   1. Determine how relative importance is to be judged
   2. Decide on the data categorization system
   3. Rank the categories from most important to least important
   4. Plot a bar graph
   5. Compute the cumulative frequency of the data categories in their chosen order

   Select the correct answer using the code given below:
   (a) 1, 3, 2, 4, 5 (b) 2, 3, 1, 5, 4
   (c) 2, 1, 3, 5, 4 (d) 1, 2, 3, 4, 5

96. Ans: (c)

Sol:

- Decide on the data categorization system
- Determine how relative importance to be judged
- Rank the categories from most important to least important
- Compute cumulative frequency
- Plota bar graph.

Directions:

Each of the next Four (04) items consists of two statements, one labelled as the 'Statement (I)' and the other as 'Statement (II)'. You are to examine these two statements carefully and select the answers to these items using the codes given below:

Codes:

(a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement(I)
(b) Both Statement (I) and Statement (II) are individually true but Statement (II) is **NOT** the correct explanation of Statement (I)
(c) Statement (II) is true but Statement (II) is false
(d) Statement (I) is false but Statement (II) is true

97. **Statement (I):** Issue of shares is the most common method especially to raise long-term funds
Statement (II): The equity shareholders are residual owners who have restricted claim on income as dividend

97. Ans: (b)

98. **Statement (I):** The slip mode of deformation is the common mode in only one crystal at ambient and elevated temperature
Statement (II): A slip plane and a slip direction that lies on it together constitute a slip system

98. Ans: (a)

Sol: Slip system is a combination of slip direction and slip plane in a crystal.
slip deformation is sliding/sliping of atomic planes in a crystal.
Ex: In FCC crystal
Slip plane is (111)
Slip direction is [101]
In FCC crystal, slip deformation is along slip plane (111) in a slip direction [101] in a slip direction [101]

99. **Statement (I):** Major e-Governance projects bear fruit only when application of IT is preceded by process re-engineering
Statement (II): Initiatives which save the citizens' time, money and effort are able to succeed even when back-end computerization is not done

99. Ans: (d)

Sol: **S1** is False, Major e – governance projects bear fruit only when application of IT is preceded by process re – engineering as it is not necessary condition (application of IT is need not to be preceded by process re – engineering for major e – governance projects bear fruit) .
S2 is TRUE, Initiative which save citizen's time, money and effort are able to succeed even with front end computerization also.

100. **Statement (I):** Moral pluralists maintain that there are moral truths, but they do not form a body of coherent and consistent truths in the way that one finds in science or mathematics
Statement (II): Moral truth are real, but partial

100. Ans: (a)

Sol: Moral pluralism is the idea that there can be conflicting moral views that are each worthy of respect. Moral pluralists tend to be open-minded when faced with competing viewpoints. They analyze issues from several moral points of view before deciding and taking action.
This implies that moral truths while being true, have to be evaluate in the context of a complex society that constitute several different ethical groups. Each group has its view of defense and hence is a partial truth for other groups until a final decision is arrived.
Second (II) justifies statement (I).
(ACE material Page No. 14)

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