MPPSC AE

Civil Engineering

Mega Mock Test - 3

(June 30th - July 1st 2022)

Questions & Solutions

1. In which of the following inscriptions of Madhya Pradesh, the first evidence of Sati Pratha was found?
   A. Mandsaur Inscription
   B. Temun Inscription
   C. Malwa Inscription
   D. Eran Inscription

Ans. D

Sol. Eran Inscription in Sagar provides the first evidence of Sati Pratha in the country. In this Inscription, Samudragupta is compared to Kuber and Yamraj.

2. In ancient India, which of the following was known as Swabhog Nagar?
   A. Satna
   B. Sagar
   C. Gwalior
   D. Jabalpur

Ans. B

Sol. Sagar of Madhya Pradesh is mentioned as 'Swabhog Nagar' in Eran Inscription. Eran inscription is related to Samudragupta of Gupta dynasty.

3. Who among the following foreign traveller described Madhya Pradesh as the 'Land of Brahmins'?
   A. Fa-Hien
   B. Huen Tsang
   C. I-tsing
   D. Abdur Razzak

Ans. A

Sol. Chinese traveller Fa-Hien visited during Chandragupta Vikramaditya of Gupta dynasty. He described Madhya Pradesh as the 'Land of Brahmins' after viewing the persistent local life.

4. In which part of Madhya Pradesh, the Parivrajak Dynasty was ruling over?
   A. Panna
   B. Malwa
   C. Vidisha
   D. Tripuri

Ans. A

Sol. Parivrajak Dynasty was a regional dynasty of Madhya Pradesh ruling contemporarily to the Gupta Empire. Panna region of Madhya Pradesh constituted their area of dominance.

5. Who among the following is credited to be the initiator of Jangarh Kalam?
   A. Sangram Shah
   B. Jammuna Devi
   C. Sardar Ganjan Singh
   D. Jangarh Singh Shyam

Ans. D

Sol. Jangarh Singh Shyam is credited to be the initiator of a new school of Indian art known as 'Jangarh Kalam'. He was conferred with the highest civilian award of Madhya Pradesh- Shikhar Samman.

6. Which of the following folk painting is done using Kharia and geru?
   A. Gudna
   B. Thapa
   C. Chitravan
   D. Mandana

Ans. D

Sol. Mandanas- in Madhya Pradesh, Madhya Pradesh are drawn on the floor. Women draw Mandana using Kharia i.e., chalk solution and geru i.e., red ochre.

7. Who among the following is credited for the construction of Bharhut Stupa?

    A. Bindusara
    B. Kunala
    C. Chandragupta Maurya
    D. Ashoka

Ans. D

Sol. Bharhut Stupa is built by King Ashoka in 3rd Century BC. Additional features of this stupa came during the period of Shunga dynasty.

8. Who among the following personalities of Madhya Pradesh demanded the separation of justice and administration department in Lahore session of 1899?

    A. Prabhakar Dundi
    B. Abdul Jaffar Khan
    C. Dr. Harisingh Gaur
    D. Durgashankar Mehta

Ans. C

Sol. Dr. Harisingh Gaur attended the Lahore session of 1899. In this session, Dr. Gaur raised the voice that Department of Justice and Administration should be separated.

9. Who among the following led the freedom movement in Rewa district of Madhya Pradesh?

    A. Madhukar Shah
    B. Ranmat Singh
    C. Thakur Saryu Prasad
    D. Avantibai

Ans. B

Sol. In Rewa district of Madhya Pradesh, Ranmat Singh led the freedom fight movement against British. Madhukar Shah was active in Raipur, Thakur Saryu Prasad was active in Vijayraghavgrah whereas Avantibai's area of influence was Ramgarh, Mandla.

10. In which year, Mahatma Gandhi started Individual Satyagraha in Jabalpur?

    A. 1939
    B. 1940
    C. 1941
    D. 1942

Ans. B

Sol. Individual Satyagraha was started by Gandhi ji as a result of August offer. Gandhi chose Acharya Vinoba Bhave as the first Satyagrahi and Nehru as the second Satyagrahi to start personal movement.

Gandhi ji launched Individual Satyagraha in Jabalpur, Madhya Pradesh in 1940.

11. Malajkhand the country largest open cast copper mines are located in which district of Madhya Pradesh?

    A. Balaghat
    B. Satna
    C. Chhindwara
    D. Sagar

Ans. A

Sol. **COPPER-ORE**

Malajkhand; the country's largest open cast copper ore mine, is situated in Balaghat district. Thus the correct answer is A

The State has 190.84 million tons of Copper ore reserves in Balaghat district, which is 41.39% of total national reserve.

The Hindustan Copper Ltd. is exploiting the copper ore from this mine

12. Which is the most influential factor in the climate of Madhya Pradesh?

A. Distance from sea   B. Vegetation

C. Latitude   D. Relief Pattern

Ans. C

Sol. • Latitude is the most influential factor in the climate of Madhya Pradesh.

• Climatic conditions of Madhya Pradesh are highly variable.

• The summers are extreme hot, the winters are extreme cold and the rainfall is either extreme or drought situation prevails.

• Madhya Pradesh has three major seasons: Summer, Monsoon and Winter.

13. Which of the following soil is/are found in Madhya Pradesh?

A. Alluvial Soil   B. Black Soil

C. Red & Yellow Soil   D. All of the above

Ans. D

Sol. • Five major types of soil are found in all over State, which are the following: Black soil, Red and Yellow soil, Alluvial soil, Mixed soil and Kachari soil.

• Black soil covers maximum area (47%) of Madhya Pradesh. It is found in Malwa plateau, Narmada-Sone valley and Satpura-Maikal range.

• Red & Yellow soil is found in the entire eastern part of the state that is Baghelkhand. Main districts include Mandla, Balaghat and Shahdol, Anooppur, Sidhi, Umaria, Singrauli etc.

• Alluvial Soil is found of the area of Central India's region which includes Bhind, Morena, Sheopur, Gwalior and Shivpuri districts.

• Mixed soil is found in Bundelkhand region.

• Kachari soil has been formed by Chambal and associated tributaries, within their catchment area. Its expanses in Bhind, Morena, Sheopur, Gwalior.

14. The "Patalkot Valley" is located in which district of Madhya Pradesh?

A. Tikamgarh   B. Chhindwara

C. Mandla   D. Ratlam

Ans. B

Sol. * Patalkot Valley is located in the Tamia tehsil of Chhindwara district in Madhya Pradesh.

* The Patalkot valley is spread over an area of 79 km2.

* 'Doodhi' river flows in the valley.

* This valley is home to a tribal culture and enormous herbal wealth.

* The Bhonsle King after defeated by British Army found this place suitable for hiding and went deep into the forest of Patalkot.

* The area is called Rajakho in Patalkot. Traditionally, the site is believed to be the entrance to Patal.

15. What is the place of Madhya Pradesh in terms of area in India?

A. First   B. Second

C. Third   D. Fourth

Ans. B

Sol. * Madhya Pradesh is the second largest Indian state by area.

* It is the fifth largest state by population with 75 million inhabitants.

* The total area of Madhya Pradesh is 3,08,252 square kilometers. It constitutes 9.38% of the nation's land area.

* It borders the states of Uttar Pradesh to the northeast, Chhattisgarh to the southeast, Maharashtra to the south, Gujarat to the west, and Rajasthan to the northwest.

* Rajasthan is the largest Indian state by area and the seventh largest by population.

16. Which of the following is the highest peak of Bundelkhand plateau whose height is 1172 m.?

A. Sidhababa   B. Pandari

C. Dhupgarh   D. None of these

Ans. A

Sol. * Bundelkhand comprises the hilly Vindhyan region, cut by ravines, and the northeastern plain.

* Sidhababa hill is the highest peak of Bundelkhand plateau whose height is 1172 m.

* The plateau is spreads over five districts of Uttar Pradesh and four districts of Madhya Pradesh.

* It is situated over the Ganga basin, made up of granite and gneiss rocks.

* The average elevation of the plateau is in the range of 300-600m.

* Rivers like Betwa, Dhasan and Ken flow through the plateau.

17. In which districts of Madhya Pradesh are the rocks of Dharwar rock group found?

A. Balaghat and Chhindwara   B. Chhatarpur and Tikamgarh

C. Shahdol and Umaria   D. Morena and Bhind

Ans. A

Sol. The Dharwar rock group is composed of material derived from erosion of the rocks of the Maha Adyakalpa. The rocks of the Dharwar rock group are found in Balaghat and Chhindwara districts of southern Madhya Pradesh. To the south of the Son River is a long narrow belt of parallel to its Dharwar rock group.

18. The Urmil project is a joint project of Madhya Pradesh and which state?

A. Uttar Pradesh   B. Bihar

C. Chhattisgarh   D. Telangana

Ans. A

Sol. The Urmil project is a joint project of the state of Madhya Pradesh and Uttar Pradesh. Under this project, a dam has been built on the Urmil river, a tributary of Ken. The length of its right main canal is 300 km and the length of distributary canals is 105 km. These canals provide water for irrigation to 7,692 hectares of land in Chhatarpur district.

19. Sindh river originates from which district of Madhya Pradesh?

A. Dewas   B. Vidisha

C. Gwalior   D. Datia

Ans. B

Sol. Sindh River is a tributary of the Yamuna which originates near Sironj 'in Vidisha district. Flowing north and north-east from here, the waters of Guna, Ashoknagar, Shivpuri, Datia, Gwalior and Bhind districts merge with the Yamuna after Chambal Sangam in Etawah district of Uttar Pradesh. The total length of the Sindh River is 470 km with 461 km in Madhya Pradesh. The Sindh river divides the Guna district into two equal parts. Major tributaries of Sindh: Pahuj, Kunwari, Mahur and Parvati.

20. Which river cuts the Tropic of Cancer twice?

    A. Narmada   B. Tapti

    C. Mahi   D. Son

Ans. C

Sol. The Mahi is a river in western India. It originates in Madhya Pradesh and, after flowing through the Vagad region of Rajasthan, enters Gujarat and flows into the Arabian Sea. Mahi River is the only river in India that cuts the Tropic of Cancer twice, first in Madhya Pradesh from where it flows towards Rajasthan and enters Gujarat where it cuts for the second time.

21. _____involves traversing the entire file system, marking everything that can be accessed.

    A. Index pointer   B. Garbage collection

    C. File system   D. Stack pointer

Ans. B

Sol. Garbage collection involves traversing the entire file system and in turn marking everything that can be accessed. Garbage collection is also known as automate memory management. It is performed by Garbage collector which recycles memory that it can prove will never be used again.

22. Which computer language is used in artificial intelligence?

    A. PROLOG   B. COBOL

    C. LOGO   D. FORTRAN

Ans. A

Sol. **PROLOG** is a general-purpose logic programming language associated with **artificial intelligence** and **computational linguistics.** There are primarily two computer languages used in artificial intelligence work, **LISP** and **PROLOG. LISP**, which is short for **List Processing**, was created by **John McCarthy** of **Stanford University.**

23. Choose the correct statement related to Crime and Criminal Tracking Network System:

    A. It is a country-wide database aimed to link all police forces to a single server to provide the information about arrested and wanted accused to the policemen.

    B. It is a project by Delhi Police to create a finger-print database to enable faster tracking and identification of arrested persons for any state in the country.

    C. It is series of high-tech measures initiated by the Jammu & Kashmir Government aimed at enhancing intra-cooperation and collaboration in State police force.

    D. None of the above.

Ans. A

Sol. The Crime and Criminal Tracking Network Systems (CCTNS) was conceptualized by the Ministry of Home Affairs in detailed consultation with all stakeholders and is being implemented as a "Mission Mode Project (MMP)" since 2009.

CCTNS aims at creating a comprehensive and integrated system for enhancing the efficiency and effective policing at all levels and especially at the Police Station level through adoption of principles of e-Governance, and creation of a nationwide networked infrastructure for evolution of IT-enabled state of- the-art tracking system around "investigation of crime and detection of criminals" in real time, which is a critical requirement in the context of the present day internal security scenario.

24. Tricking the user into a fake website link through e-mail to access personal and private information like passwords is called:

A. Pharming   B. Spam

C. Spoofing   D. Phishing

Ans. D

Sol. In phishing attack, a fake website is created which almost looks like the actual website. The link is sent through mail delivery which tricks the user into believing that it is an original site and enter the sensitive information like passwords.

25. Which of the following platforms is not an inference from government to citizens (G2C)?

A. E-Citizenship   B. E-Transportation

C. E-police   D. E-Registration

Ans. C

Sol. E-police is an example of government-to-government interactions. It refers to the use of ICT for the purpose of facilitating the work of the police department in investigation and administration.

26. CAIT launched………vendor onboarding mobile app.

A. Bharat e market   B. India e market

C. Bharat e dukaan   D. India e mart

Ans. A

Sol. Confederation of all India traders (CAIT) recently launched Bharat e market app. This will be the first and foremost e-commerce Portal from GOI. There is no place for Chinese products in this portal. It will benefit wholesaler, distributor, retailer and small businesses.

27. Which of the following device is used to extend the network without reducing signal strength?

A. Repeater   B. Router

C. Gateway   D. Switch

Ans. A

Sol. A **repeater** is an electronic device that **receives** a signal and **retransmits** it without reducing **signal strength.**

Repeaters are used to **extend transmissions** so that the signal can cover longer distances and extend the range of **local area network.**

28. Data governance quality index survey is conducted by:

A. NITI Aayog.   B. MIETY

C. World economic forum   D. None of the above

Ans. A

Sol. Data governance quality index (DGQI) survey is conducted by development monitoring and evaluation office, NITI Aayog. It is to assess different ministries and department performance on the implementation of central sector schemes and central sponsored schemes. Its aim is to drive healthy competition and promote cooperative peer learning.

29. SWIFT code is related to:

A. International banking transaction

B. Payment gateway system

C. Quick toll plaza electronic payment system

D. All of the above

Ans. A

Sol. The SWIFT (society for worldwide interbank financial telecommunications) is a secure financial message carrier. It transports messages from one bank to its intended bank recipient. It's core role is to provide secure channel between banks.

30. Project NETRA aims to:

A. explore the solar system.   B. aid detection.

C. detect debris to Indian satellites.   D. ease navigation.

Ans. C

Sol. ISRO initiated a project called Project NETRA, which is an early warning system in space to detect debris and other hazards to Indian satellites. Under NETRA the ISRO plans to put up many observational facilities: connected radars, telescopes; data processing units and a control centre. They can, among others, spot, track, and catalogue objects as small as 10 cm, up to a range of 3,400 km and equal to a space orbit of around 2,000 km.

Project NETRA consists of high-precision, long-range telescope in Leh and a radar in the North East. Along with them, the Multi-Object Tracking Radar (MOTR) at the Satish Dhawan Space Centre in Sriharikota, and the telescopes at Ponmudi and Mount Abu.

31. Which one of the following is correct regarding recognition of a party as a national party?

A. If any party is recognized as a state party in at least four states, then it gets recognized as a national party.

B. If any party is recognized as a state party in at least six states, then it gets recognized as a national party.

C. If any party is recognized as a state party in at least three states, then it gets recognized as a national party.

D. None of these

Ans. A

Sol. At present, a party is recognised as a national party if any of the following conditions is fulfilled:

1. If it secures six per cent of valid votes polled in any four or more states at a general election to the Lok Sabha or to the legislative assembly; and, in addition, it wins four seats in the Lok Sabha from any state or states; or

2. If it wins two per cent of seats in the Lok Sabha at a general election; and these candidates are elected from three states; or

3. If it is recognised as a state party in four states.

32. In which year, the leader of Opposition was accorded statutory status in India?

A. 1969   B. 1977

C. 1965   D. 1989

Ans. B

Sol. In a parliamentary system of government, the leader of the opposition has a significant role to play. His main functions are to provide a constructive criticism of the policies of the government and to provide an alternative government. Therefore, the leader of Opposition in the Lok Sabha and the Rajya Sabha were accorded statutory recognition in 1977. They are also entitled to the salary, allowances and other facilities equivalent to that of a cabinet minister.

33. Who among the following earlier served as the Chief Minister of a state and later appointed as the Prime Minister of India?

A. Inder Kumar Gujral   B. Atal Bihari Vajpayee

C. P.V. Narasimha Rao   D. None of these

Ans. C

Sol. Six people–Morarji Desai, Charan Singh, V.P. Singh, P.V. Narasimha Rao, H.D. Deve Gowda and Narendra Modi became Prime Ministers after being Chief Ministers of their respective States. P.V. Narasimha Rao, the first Prime Minister from South India, who held the post from 1991–1996, was Chief Minister of Andhra Pradesh between 1971–1973.

34. Under which article of the Indian Constitution, the Rajya Sabha is empowered to frame laws on any matter enumerated in the State List, if it is necessary or expedient in the national interest?

A. Article 248   B. Article 249

C. Article 250   D. Article 252

Ans. B

Sol. If the Rajya Sabha declares by a resolution supported by not less than 2/3 of its members present and voting, that it is necessary or expedient in the national interest that the Parliament should make laws with respect to any matter enumerated in the State List (Art.249). After such a resolution is passed, Parliament can make laws for the whole or any part of the territory of India. Such a resolution remains in force for a period of 1 year and can be further extended by one year by means of a subsequent resolution.

35. What is the rank of Madhya Pradesh according to the Gross Domestic Product?

A. 2nd B. 5th

C. 10th D. 11th

Ans. C

Sol. The total GDP of Madhya Pradesh state is 9.68 lakh crore for the year 2019-20. It ranks 10th among the Indian state for GDP. The maximum share is possessed by Agriculture sector (45%), followed by Industry and services sector.

36. Who among the following has been the Governor of Gujarat, Pondicherry and Madhya Pradesh?

A. N N Wanchu   B. K. M. Chandy

C. M A Khan   D. Sarla Grewal

Ans. B

Sol. * KM Chandy served as the governor of the Indian states of Gujarat, Madhya Pradesh and the Union Territory of Pondicherry.

* The first ever Youth Congress Unit was started by him in the year 1953.

* He served as the Governor of Madhya Pradesh from 15 May 1984 to 30 March 1989.

37. Which of the following Lok Sabha Seat of Madhya Pradesh is reserved for Scheduled Castes (SC)?

A. Bhind   B. Dewas

C. Tikamgarh   D. All of the above

Ans. D

Sol. * The number of Lok Sabha seats in Madhya Pradesh is 29, while the number of Rajya Sabha seats is 11.

* Out of 29 parliamentary constituencies of Madhya Pradesh, the number of SC and ST parliamentary constituencies are 4 and 6 respectively.

* 4 seats are reserved for SC candidates namely Bhind, Tikamgarh, Dewas and Ujjain, whereas Shahdol, Mandla, Ratlam, Dhar, Khargone and Betul constituencies are reserved for ST.

38. Who among the following is the Speaker of Madhya Pradesh Legislative Assembly?

A. Narendra Kumar Jain   B. Girish Gautam

C. AK Shukla   D. Rajan S. Katoch

Ans. B

Sol. BJP MLA Girish Gautam was unanimously elected as Speaker of the Madhya Pradesh Assembly on the first day of the State Budget session on February 22, 2021. Chief Minister Shivraj Singh Chouhan moved a proposal in the House to elect Mr. Gautam as the Assembly's Speaker.

39. The Ladli Laxmi Yojana run by the Madhya Pradesh government is related to which field?

A. Girl Education   B. Employment

C. Agriculture   D. Violence

Ans. A

Sol. The benefits of the scheme are extended to the parents, who had adopted family planning after two alive children, are registered in an Anganwadi center and are not income tax payees.

The objective of this scheme, implemented from the year 2006 is to lay a firm foundation of girls' future through improvement in their educational and economic status and to bring about a positive change in social attitude towards the birth of a girl. Under the scheme, National Savings Certificates worth Rs 6 thousand are purchase by the state government in the name of a girl every year after her birth till the amount reaches Rs 30,000. The girl covered under the scheme is given Rs 2 thousand on getting admission in class VI, Rs four thousand on getting admission in class IX and Rs 7,500 on admission in class XI. She is given Rs 200 per month during her studies in class XI and XII. When the girl attains the age of 21 and had not married before 18 years of age, she will be paid the amount in lump sum, which comes to Rs one lakh.

40. When was the 'Ram Roti Scheme' launched by the Madhya Pradesh government?

    A. 2004   B. 2012

    C. 2010   D. 2008

Ans. C

Sol. Ram Roti Yojana was launched in November 2010 by Chief Minister Shivraj Singh Chauhan from Rain Basera of Shahjahani Park, Bhopal. To provide food at a cheap rate to the poor of the state, four cities of the state, Indore, Bhopal, Jabalpur and Gwalior have been started. Under the scheme, poor people living in night shelters have food for ₹ 5 and accommodation of ₹ 2 per night.

41. Which Indian city has the most Traffic congestion, as per TomTom Traffic Index 2021?

    A. Kolkata   B. New Delhi

    C. Mumbai   D. Bengaluru

    E. Chennai

Ans. C

Sol. • Geo-location technology specialist TomTom has released the 11th edition of its annual TomTom Traffic Index.

    • It is a report analysing traffic trends seen in 404 cities in 58 countries, during 2021.

    • Mumbai and Bengaluru have emerged as the 5th and 10th most congested cities in the world in 2021, despite pandemic-related restrictions keeping cars off the roads for the most part.

    • Delhi and Pune ranked 11th and 21st among 404 cities across 58 countries, according to TomTom Traffic Index's global top 25 list.

42. Which state govt signed an MoU with QX Global Group Limited for the holistic development of the Information Technology and IT Enabled Services (ITeS) sector in the State?

    A. Maharashtra   B. Madhya Pradesh

    C. Gujarat   D. Rajasthan

    E. Haryana

Ans. C

Sol. * Gujarat government signed an MoU with QX Global Group Limited for the holistic development of the Information Technology (IT) and Information Technology Enabled Services (ITeS) sector in the State.

* The Gujarat government's Department of Science and Technology had announced a new IT/ ITeS policy for the next 5 years in order to develop a robust ecosystem for the IT and digital sector.

* The policy also aims from the current Rs 3,000 crore annually to Rs 25,000 crore over the next five years.

* The MoU is the 1st strategic partnership under the new Gujarat IT/ITeS policy 2022-2027and will generate 2,000 jobs in the IT sector.

43. International Institute for Population Sciences (IIPS) is located in which city where two new new Centres called 'Centre of Demography of Gender' and 'Centre for Ageing Studies' are inaugurated recently?

A. Bengaluru   B. Hyderabad

C. Chennai   D. Mumbai

E. New Delhi

Ans. D

Sol. • International Institute for Population Sciences (IIPS) is located in Deonar, Mumbai.

• Here two new Departments and two new Research Centres were inaugurated by Union Health and Family Welfare Minister Dr. Mansukh Mandaviya and Minister of State for Health and Family Welfare Dr. Bharati Pawar.

• The newly inaugurated departments are 'Department of Survey Research and Data Analytics' and the 'Department of Family and Generations'. The new Centres are called 'Centre of Demography of Gender' and 'Centre for Ageing Studies'.

• The new departments and centres will work in line with the vision of taking Indian institutions to global level and making the country self-reliant.

44. Who has been honoured with the Outstanding Contribution To Film Industry award at the Dadasaheb Phalke International Film Festival Awards 2022?

A. Rakhi Gulzar   B. Mumtaz

C. Waheeda Rehman   D. Asha Parekh

E. Hema Malini

Ans. D

Sol. • Legendary actor Asha Parekh has been honoured with Outstanding Contribution to Film Industry accolade at Dadasaheb Phalke International Film Festival Awards 2022.

45. The Indian Air Force (IAF) has conducted sixth edition of Eastern Bridge-VI exercise with which country?

A. UAE   B. Oman

C. Qatar   D. Israel

E. Singapore

Ans. B

Sol. • The Indian Air Force (IAF) and the Royal Air Force of Oman conducted a five-day bilateral exercise at the Jodhpur air force station.

• The exercise named Eastern Bridge-VI is in its sixth edition.

• Exercise Eastern Bridge V was held in October 2019 at the Air Force Base Masirah, Oman.

• The IAF contingent comprised MiG-29 and C-17 aircraft. It was the first time that MIG-29 fighter aircraft participated in an International Exercise outside India.

46. 550-tonne capacity 'Gobar-Dhan' Bio-CNG plant has been inaugurated in which city by Prime Minister Narendra Modi?

A. Hyderabad   B. Indore

C. Gwalior   D. Bhopal

E. Nagpur

Ans. B

Sol. * PM Modi inaugurated 550-tonne capacity 'Gobar-Dhan' Bio-CNG plant in Indore.* It is based on the concept of waste-to-wealth innovation.

* The municipal solid waste based Gobar-Dhan plant is in line with PM's vision of creating "garbage-free cities" under the Swachh Bharat Mission Urban 2.0.

* The Gobar-Dhan plant will have the capacity to treat 550 tonnes of segregated wet organic waste and produce around 17,000 kg CNG and 100 tonnes of organic compost per day.

47. Which global IT Services and Technology Solutions Company, has partnered with Microsoft for its launch of 'Microsoft Cloud for Retail'?

A. ITC Infotech   B. Sonata Software

C. HCL Technologies   D. Hinduja Global Solutions

E. Tata Consultancy Services

Ans. B

Sol. * Sonata Software, a global IT Services and Technology Solutions Company announced its partnership with Microsoft for its launch of 'Microsoft Cloud for Retail'.

* The company has been a partner with Microsoft for over three decades.

* The 'Microsoft Cloud for Retail' collaboration is expected to further strengthen the relationship.

* Sonata Software delivers solutions for retailers world-wide, leveraging world-class IPs, in-house migration and modernisation tools.

48. Renowned personality Chandupatla Janga Reddy passed away recently, he was a veteran _____.

A. Nuclear Scientist   B. Journalist

C. Politician   D. Film Actor

E. Telugu Writer

Ans. C

Sol. * The first Lok Sabha MP for the BJP from south India Chandupatla Janga Reddy (87-years) passed away

* Reddy was one of the only two BJP Lok Sabha MPs elected in the 1984 general elections, conducted after the assassination of Prime Minister Indira Gandhi.

* The other BJP MP was A K Patel, who was elected from Mehsana in Gujarat.

49. Renowned personality Praveen Kumar Sobti passed away recently, he was a veteran _____.

A. Politician   B. Actor

C. Writer   D. Doctor

E. Lawyer

Ans. B

Sol. • Actor Praveen Kumar Sobti, popular for essaying the role of Bheem in BR Chopra's Mahabharat passed away recently.

• Besides playing the role of Bheem, which made him a household name, Kumar also starred in many films including Amitabh Bachchan-starrer Shehenshah and Dharmendra's Loha.

• Other films to his credit include Aaj Ka Arjun, Ajooba, and Ghayal, among others.

• Before he became an actor, Praveen was a hammer and discus throw athlete. A four-time Asian Games medallist, he also represented India in 1968 Mexico and 1972 Munich Olympics.

• He was also honoured with Arjuna award.

• He worked as the Deputy Commandant in the Border Security Force (BSF) as well.

50. Amazon India has signed a Memorandum of Understanding (MoU) with which state government to support the growth the women entrepreneurs?

A. Karnataka   B. Tamil Nadu

C. Kerala   D. Andhra Pradesh

E. Odisha

Ans. A

Sol. • Amazon India has signed a memorandum of understanding (MoU) with Karnataka State Rural Livelihood Promotion Society (KSRLPS) to support the growth of women entrepreneurs.

• Amazon India would launch Sanjeevini-KSRLPS in its marketplace and extend benefits of the 'Saheli' programme to train and empower thousands of women entrepreneurs to come online and access a wider market for their products.

51. Tubular sections are most suitable for small load and length, because

A. The tubes have same radius of gyration in all direction.

B. Tube have high local buckling strength.

C. Tubes have more torsional resistance.

D. All of these

Ans. D

Sol. Tubes are mut suitable for small loads and length these section are usually provided for root truss and bracing. They have high load buckling strength and torsional resistance.

52. Euler's formula holds good only for

A. Short columns   B. Long columns

C. Both short and long columns   D. Intermediate columns

Ans. B

Sol. * Euler's formula holds good only for long commons.

* Long commons can be analyzed with the Euler's common formula can be given as.

$$P = \frac{\pi^2 EI}{\text{Left}}$$

Let = effective length is depending upon end support condition common.

53. A simply supported beam of length 3 m is subjected to a uniformly distributed load of 1.5 kN/m. If the cross-section of the beam is rectangular with 100 mm (width) × 150 mm (depth), the maximum shear stress would be :

A. 0.225 N/mm²   B. 0.3 N/mm²

C. 0.45 N/mm²   D. 0.6 N/mm²

Ans. A

Sol. **SHEAR FORCE DIAGRAM FOR A SIMPLY SUPPORTED BEAM CARRYING A UNIFORMLY DISTRIBUTED LOAD**
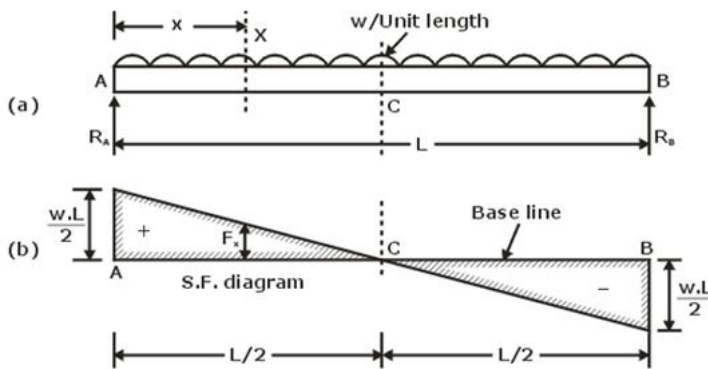
L = beam of length 3 m

W = uniformly distributed load = 1.5 kN/m. If the cross-section of the beam

Maximum shear stress for rectangular section

Fig. 8.4

b = width of beam = 100 mm

d = Depth of beam = 150 mm

As per Shear force diagram

V = maximum shear force = $\dfrac{WL}{2} = \dfrac{1.5 \times 3}{2} = 2.25\,kN$

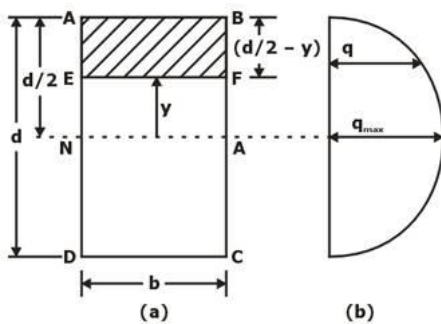$$\tau_{avg} = \frac{\text{Shear forces}}{\text{Area of section}} = \frac{V}{b \times d} = \frac{2.25 \times 10^3}{100 \times 150} = 0.15 \text{N}/\text{mm}^2$$

$$\tau_{max} = \frac{3}{2} \times \tau_{avg}$$

$$\tau_{max} = \frac{3}{2} \times 0.15 = 0.225 \text{N}/\text{mm}^2$$

54. A circular bar AB having length "L", fixed at both ends is loaded by a distributed torque of constant intensity "q/ unit" distance along the axis of the bar and varies linearly in intensity from zero at one end A. and "q_0" at other ends B.. What will be the torque at A?

A. $(q_0L)/6$ B. $(q_0L)/4$

C. $(q_0L)/10$ D. $(2q_0L)/6$

Ans. A

Sol. This is similar to load distribution.

The torque at the A will be $q_0 L/6$, and the torque at B will be $q_0 L/3$.

55. A simply supported beam with a rectangular cross-section is subjected to a central concentrated load. If the width and depth of the beam are doubled, then the deflection at the centre of the beam will be reduced to :

A. 50%   B. 25%

C. 12.5%   D. 6.25%

Ans. D

Sol.
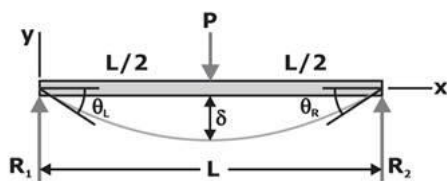
P= central concentrated load

L= length of the beam

I= moment of inertia

Consider a rectangle of breadth b and depth d
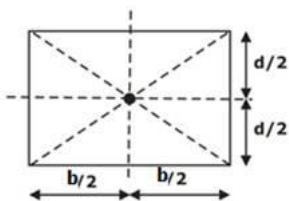
For rectangular section = I= $\dfrac{bd^3}{12}$

Maximum deflection = δ = $PL^3/48EI$

$$\delta = \frac{PL^3}{48EI} = \frac{k}{I} \quad \left[\therefore k = \frac{PL^3}{48E} \right]$$

$$\delta = \frac{12 \times k}{bd^3}$$

δ' = new deflection due to change in dimensions

$$\delta' = \frac{12 \times k}{b'd'^3}$$

When b'= 2b , d'= 2d (new breadth= b' and new depth= d')

$$\delta' = \frac{12 \times k}{2 \times b \times (2 \times d)^3}$$

$$\delta' = \frac{\delta}{16} = 6.25\%$$

56. A rod of material with E = 200 GPa and α = 200 × 10^{-3} mm/mm°C is **fixed at both ends**. It is uniformly heated such that the increase in temperature is 30°C . The total strain in the rod is :

A. 3 × 10^{-3} B. zero

C. 1.5 × 10^{-3} D. 6 × 10^{-3}

Ans. B

Sol. L = Original length of the body,

T = Rise in temperature,

E = Young's Modulus

α = Co-efficient of linear expansion.

dL = Extension of rod due to rise of temperature.

dL = L× α × T

As Rod is fixed at both ends dL=0

As Rod is fixed at both ends, the total strain in the rod is zero.

$$\varepsilon = \frac{dL}{L} = 0 \quad [dL = 0]$$

57. A cantilever beam of length L, a moment of Inertia I, Young's modulus E carries of a concentrated load W at the middle of its length. The slope of the beam at the free end is :

A. WL^2/2EI   B. WL^2/4EI

C. WL^2/6EI   D. WL^2/8EI

Ans. D

Sol.

L = length of the beam

I= moment of inertia

E= Young's modulus

W= concentrated load

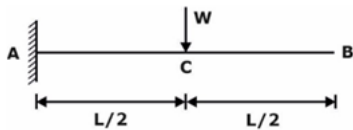**Concentrated load at any point on the span of the cantilever beam**
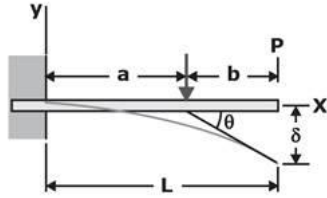
Slope at end = θ = $Pa^2/2EI$

It is given that concentrated load is acting at the middle of its length

Hence a=b= L/2, P =W (given)

$$\text{Slope at end} = \frac{W\left(\dfrac{L}{2}\right)^2}{2EI} = \frac{WL^2}{8EI}$$
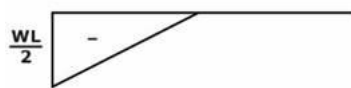
ALTERNATE METHOD

L = length of the beam

I= moment of inertia

E= Young's modulus

W= concentrated load

THE LOADING Diagram, SFD, BMD, respectively as follows
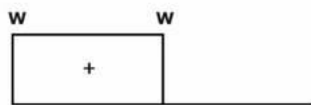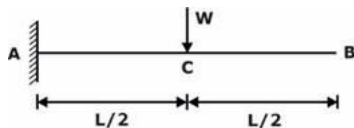
Using the area moment method

θ would be zero as there is fixed support at A.

$$\theta_C - \theta_A = \frac{\text{Area of BMD between C and A}}{EI}$$

$$\therefore \theta_C = \frac{1}{2} \times \frac{WL}{2} \times \frac{L}{2} \times \frac{1}{EI} = \frac{WL^2}{8EI}$$

58. A prismatic bar with rectangular cross-section 20 × 40 mm, length = 2.8 m is subjected to axial tension force of 70 kN. The measured elongation of bar is 1.2 mm. What will be the strain ?

A. 428×10^{-6} B. 400×10^{-6}

C. 450×10^{-6} D. None of these

Ans. A

Sol. $\Delta = \frac{PL}{AE} = \frac{70\times10^3 \times 2.8\times10^3}{20\times40\times E}$, Strain $= \frac{12mm}{2.8\times10^3 mm} = 4.28\times10^{-4}$

59. Euler's crippling load formula gives buckling load of long columns that is the ultimate load a column can take. Mathematically Euler's formula can be expressed as

Where,

P = Buckling load

E = Modulus of Elasticity of material

I = Moment of Inertia of column section

L = Equivalent/Effective length of column)

A. $P = \frac{\pi^2 EI}{L^2}$

B. $P = \frac{\pi^2 EI}{4L^2}$

C. $P = \frac{2\pi^2 EI}{L^2}$

D. $P = \frac{4\pi^2 EI}{L^2}$

Ans. A

Sol.

$$P_r = \frac{\pi^2 EI}{L^2}$$

60. A rigid frame ABCD with vertical members AB and CD is pinned at A and roller supported at 'D'. Horizontal member BC is loaded with vertical point load of 90 kN at the centre of BC

. AB=BC=CD=3m. If support A rotates by $\frac{1}{300}$ rad, and also sinks downward by 30mm.

The reactions at A and D:

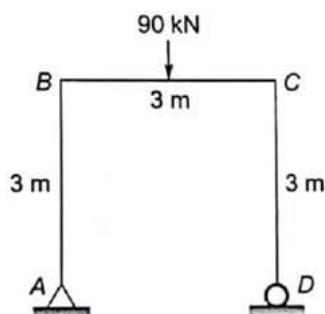A. shall be affected due to rotation and sinking

B. shall not be affected due to rotation and sinking

C. reaction at A shall change but reaction at D shall not change due to rotation and sinking

D. None of the above

Ans. B

Sol.

$D_s=(2+1)-3=0$

Structure is determinate:

• Since structure is determinate, reaction of A and D shall not be affected duet to rotation and sinking, because determinate structures can allow rotation and sink without generating additional reactions. It is because they are not stiff enough to generate resistance to rotation and translations of joints.

61. The degree of static indeterminacy of pin-jointed space frame is given by:

A. m+r-2j

B. m+r-3j

C. 3m+r-3j

D. m+r+3j

Ans. B

Sol. For a pin jointed space frame

$$D_s = D_{se} + D_{si}$$
$$= (r-6) + (m-(3j-6))$$

= m + r − 3j

Unknown No. of compatibility

reactions equations

62. Substitute frame method is used to analyse the building frame if the frame is subjected to _____.

A. Lateral loads due to wind

B. Lateral loads duet o earthquake

C. Vertical live load only

D. Vertical dead load and live loads

Ans. D

Sol. • Substitutive frame method for analysis of multistory frame can be hardy in approximate and quick analysis. This method has been applied only for vertical leading conditions.

• The method assumes that the moments in the beams of any floor are influenced by loading on that floor alone. The influence of loading on the lower or upper floors is ignored all together.

• The process involves the division of multistoried structure into smaller frames. These sub frame are known as equivalent frames or substitutive frames.

63. In the force method of analysis of indeterminate trusses, if the truss is indeterminate to degree one, the change in length of redundant member due to unit force is found by using the formula where A is cross-sectional area

I- Moment of Inertia

n- force in the member due to unit load application

N- force in the member due to actual load

E- Modulus of Elasticity

A. $\sum \dfrac{nNL}{EI}$

B. $n\sum \dfrac{NL}{AE}$

C. $\sum \dfrac{nNL}{AE}$

D. $\sum \dfrac{NL}{AE}$

Ans. C

Sol.

$$\Delta_t = \sum \frac{nNL}{AE}$$

It is derived from virtual worth (or unit load) method. It says

External virtual load x actual deflection=Virtual stress due to virtual loads x actual internal deflections due to real forces

$$1. \Delta_t = \sum (n) x \left(\frac{NL}{AE} \right)$$

64. Which of the following is an incorrect assumption in the analysis of truss?

A. All joints are pinned

B. Loads applied at joints only

C. All members are straight

D. Weights of members are acting at their centres

Ans. D

Sol. Weights of members are considered to be acting at joints and not at centre.

65. Match the List-I with List-II and select your correct answer using the codes given below:

List-I (Name of the associated with the methods)

a. G.N. Maney

b. Hardy cross

c. Euler

d. Clapeyron

List-II (Method)

1) Moment distribution

2) Slope deflection method

3) Theorem of three moments

4) Crippling load on column

A. a-2 b-1 c-4 d-3   B. a-1 b-2 c-3 d-4

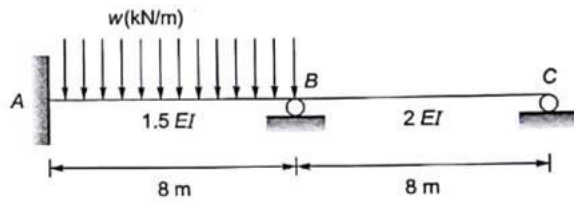C. a-1 b-2 c-4 d-3   D. a-2 b-1 c-3 d-4

Ans. A

Sol. G.N. Maney gave slope deflection method.

Hardy cross gave moment distribution method.

Euler gave formula for crippling load on column.

Clapeyron gave theorem of 3 moments.

66. Using slope-deflection method, the stiffness K_{AB} and K_{BC} of a beam shown below respectively are

A. $\dfrac{1.5EI}{8} \ and \ \dfrac{2EI}{8}$

B. $\dfrac{EI}{2} \ and \ \dfrac{3EI}{8}$

C. $\dfrac{3EI}{8} \ and \ \dfrac{EI}{2}$

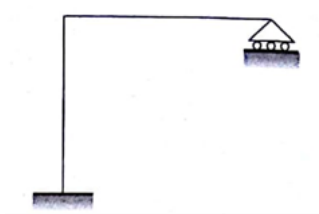D. $\dfrac{1.5EI}{8} \ and \ \dfrac{EI}{4}$

Ans. C

Sol.

In slope deflection method, stiffness is given as $\dfrac{2EI}{8}$

$K_{AB} = \dfrac{2(1.5EI)}{8} = \dfrac{3EI}{8}$

$K_{BC} = \dfrac{2(2EI)}{8} = \dfrac{4EI}{8} = \dfrac{EI}{2}$

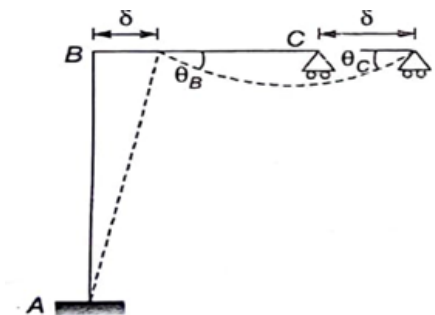67. The Kinematic Indeterminacy of a frame as shown is:

A. KI=1

B. KI=2

C. KI=3

D. KI=5

Ans. C

Sol.

$KI = 3(\delta, \theta_B \, and \, \theta_c)$

OR

From Standard formula, $D_k = 3j - r_e - m$

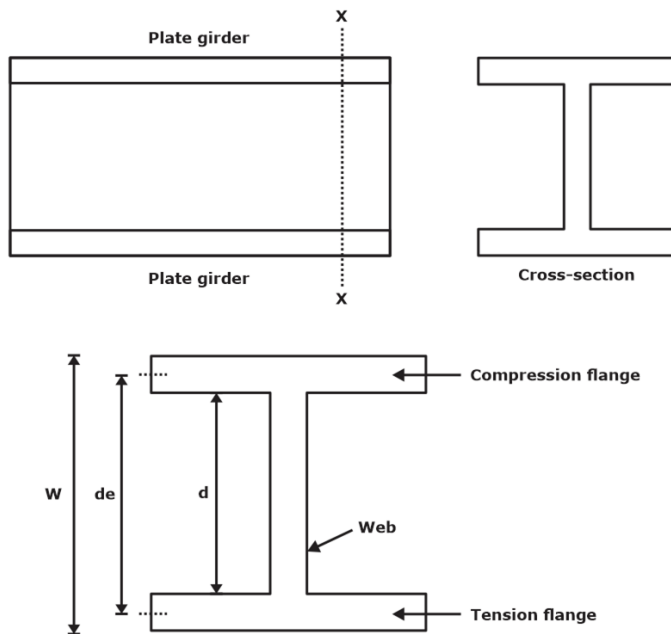J = Number of joints = 3

r_e = No. of support reactions = 4

m = Inextensible members = 2

$D_{k} = 9-4-2 = 3$

68. The distance between C.G. of compression and C.G. of tension flanges of a plate girder is known as

    A. Clear depth   B. Overall depth

    C. Effective depth   D. None of the above

Ans. C

Sol. Concept:

As shown in above figure.

W = Overall depth of a section

d_{e} = Effective depth

d = Clear depth of web

effective depth is defined as the distance between the C.G. of compression flange and tension flange.

69. When two plates are placed end to end and are joined by two cover plates, the joint is known as

    A. Chain riveted lap joint   B. Double cover butt joint

    C. Zig-zag riveted lap joint   D. Butt joint

Ans. B

Sol. Lap joint: In their type of joint two members are joined by overlapping one member over another.

Butt joint: here the two members to be connected are placed end to end thereby bringing the load lines in the two members in one line and reducing eccentricity to zero.

The butt joint is single cover butt joint if the plate is provided only on one side of the main plate and is called as double cover butt joint if the plates are provided on both sides of main plate.

Dobule Cover Butt Joint

Single Cover Butt Joint
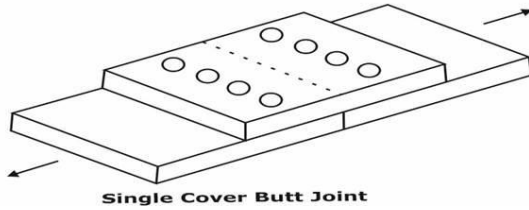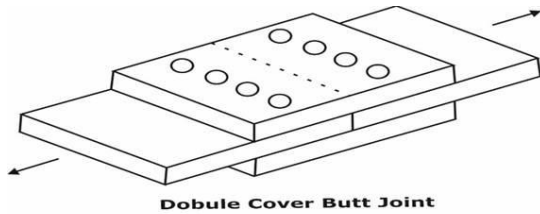
70. If d and t are the effective depth and thickness of a beam respectively and ε is the yield stress ratio, the webs shall be checked for shear buckling when _____

A. d/t > 67 ε
B. d/t < 67 ε
C. b/d < 67 ε
D. b/t > 67 ε

Ans. A

Sol. If d and t are the effective depth and thickness of a beam, respectively and ε is the yield stress ratio

Check for shear buckling

• When d/t< 67 ε (No shear buckling in web)

• When d/t> 67 ε (web of beam susceptible to shear buckling)

71. For temperature less than _____, no reduction in the yield stress need to be considered for both mild steels and high strength low alloy steels.

A. 500°C
B. 1000°C
C. 50°C
D. 215°C

Ans. A

Sol. • In the temperature range 150°C - 350°C and 800°C - 900°C, yield strength increases with an increase in temperature.

• In temperature 400°C to 750°C and above 900°C it decreases with temp

• The best temperature range for steels is 400°C to 700°C, which is the range of warm working for steels

72. Lug angles:

A. Are always equal angles
B. Reduce the length of joint
C. Increase the length of joint
D. Are unequal angles

Ans. B

Sol. Lug angles are used to reduce the length of joint .

73. Cruising speed of aircraft is

A. speed of aircraft with respect to wind

B. speed of aircraft with respect to ground

C. speed of flight

D. speed of pilot

Ans. B

Sol. Cruising speed/ground speed - Aircraft speed with respect to ground when aircraft is in air at its maximum speed.

Air speed - Aircraft speed relative to wind.

74. As per ICAO, for airports serving big aircrafts, the crosswind component should not exceed

A. 15 Kmph   B. 25 Kmph

C. 35 Kmph   D. 45 Kmph

Ans. C

Sol. According to ICAO

Type of aircraft	Permissible limit of cross wind component (Kmph)
Small aircraft	15
Mixed aircraft	25
Big aircraft	35

75. The following operations are generally employed for the Needle Beam Method if tunneling:

A) A trench jack is placed on the centre line of the needle beam to support the segment.

B) A monkey drift is driven for a short distance

C) Drift is widened sideways and supported by lagging segments

D) The roof of the monkey drift is supported by lagging

E) The needle beam is slowly skidded forward into the monkey drift.

The correct sequence of operation is

A. C – D – E – A – B   B. A – B – C –D – E

C. B – D – E – A – C   D. B – A – E – D – C

Ans. C

Sol. Needle beam consists of a stout timber beam or a composite flinched beam and from the main temporary support during the excavation. This method is suitable for soils where roof can with stand for a few minutes.

76. A tunnel is found more advantageous as compared to the alternate routes because it

A. Remains free from snow

B. Reduces the cost by reducing the route distance

C. Avoids interference with surface rights

D. All of the above

Ans. D

Sol. Advantage of tunnel as compared to alternate routes are as follows:

1. Tunnel is remains free from show in cold region.

2. It avoids the long circuitous route around a mountain or spur.

3. Due to shortening in distance, tunnel have proved economical.

4. Reduced the cost by reducing the route distance.

5. Tunnel avoid interference with surface rights.

6. Tunnel allow rapid and unobstructed transport facilities in big congested cities.

77. The place, where aircrafts wait for take-off is

A. Holding apron   B. Ready apron

C. Hangar   D. Reserved apron

Ans. A

Sol.

78. Runway threshold is indicated by series of parallel lines starting from a distance of

A. 3 m from runway end   B. 6 m from runway end

C. 1 m from runway end   D. 15 m from runway end

Ans. B

Sol. Runway threshold is indicated by series of parallel lines starting from a distance of 6m from runway end.

79. In an ideal transition curve, the radius of curvature is

A. Constant

B. Directly proportional to its distance from the point of commencement

C. Inversely proportional to length curve

D. Directly proportional to radius of main curve

Ans. C

Sol. In an ideal transition curve

L_γ = Constant

L = Length of transition curve

$\gamma \propto \dfrac{1}{L}$

80. The maximum superelevation to be provided on a road curve is 1 in 15 . If the rate of change of superelevation is specified as 1 in 120 and the road width is 10 m, then the minimum length of the transition curve on each end will be :

A. 1.25 m   B. 80 m

C. 100 m   D. 120 m

Ans. B

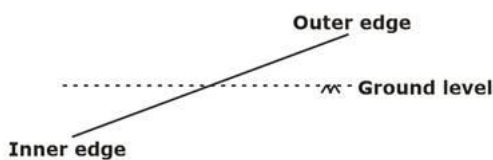Sol. rate of change of superelevation is specified = 1/N= 1 /120

N= rate of superelevation =120

e= superelevation = $\dfrac{1}{15}$

W = width of road=10 m

L= Length of curve

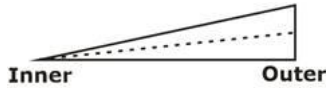**Case 1: Rotation about centre**

$L = \dfrac{e \times W \times N}{2}$

26

$$L = \frac{\frac{1}{15} \times 10 \times 120}{2} = 40m$$

Case 2: Rotation about inner edge:

$$L = e \times W \times N$$

$$L = \frac{1}{15} \times 10 \times 120 = 80\,m$$

As per option, 80 m will be our answer

81. What would be the extra widening required for a two-lane national highway at a horizontal curve of 300 m radius if a wheelbase of 8 m and a design speed of 100 kmph are to be considered?

A. 0.42 m   B. 0.62 m

C. 0.82 m   D. 0.92 m

Ans. C

Sol. V = speed of vehicle = 100 km/hr

l = length of wheel base =8 m

n = number of lanes= 2

R = radius of curve= 300 m

Extra widening $= \dfrac{n \times l^2}{2 \times R} + \dfrac{v}{9.5 \times \sqrt{R}} = \dfrac{2 \times 8^2}{2 \times 300} + \dfrac{100}{9.5 \times \sqrt{300}} = 0.82$ m

82. On a hill road a ruling gradient of 5% is provided and has a radius of horizontal curve of 50 m. Design speed on the road is 50 kmph. The gradient of the curve is _____ %.

A. 3 %   B. 3.5 %

C. 4 %   D. 4.5 %

Ans. C

Sol. When there is horizontal curve in addition to gradient then there will be increased resistance to traction due to both curve and gradient. Therefore, it is necessary to compensate gradient at horizontal curve.

Grade compensation (G.C%) = $\min \begin{Bmatrix} (30 + R) / R \\ 75 / R \end{Bmatrix}$

$= \min \begin{Bmatrix} 1.6 \\ 1.5 \end{Bmatrix} = 1.5\%$

Compensated gradient = Gradient – GC

= 5 – 1.5 = 3.5%

According to IRC, grade compensation is not necessary for gradient flatter than 4%.

So, option © 4% is correct answer.

83. Among various stages of survey in highway alignment, the correct sequence is

A. reconnaissance, map study, and preliminary survey

B. reconnaissance, map study, and detailed survey

C. map study, reconnaissance, preliminary survey and detailed survey

D. None of these are correct

Ans. C

Sol. For any survey of a highway alignment, correct order of study is

i. Map study

ii. Reconnaissance survey

iii. Preliminary survey and

iv. Detailed survey

84. In which of the following solvents bitumen dissolves?

1) Carbon disulphide

2) Carbon tetrachloride

3) Benzene

4) Naphtha

A. 2 and 3   B. 1 and 4

C. 3 and 4   D. 1 and 2

Ans. D

Sol. Bitumen dissolves in carbon disulphide and carbon tetrachloride solvent

Option (D) 1 and 2 is correct.

85. Which of the following is considered to be the highest quality construction in the group of black top pavements

A. Bituminous carpet   B. Bituminous concrete

C. Mastic asphalt   D. Sheet asphalt

Ans. B

Sol. Bituminous concrete is considered to be of best quality in pavements since it has properties of both bitumen and concrete. It is strong, durable and water resistant.

86. Burmister considered the pavement structure as a homogeneous half space. Here the half-space means:

A. infinite area with infinite depth

B. finite area with infinite depth

C. finite area with finite depth

D. infinite area with finite depth

Ans. D

Sol. Assumption of Burmaster's method.

• Materials in each layer are isotropic, homogenous and elastic.

• Pavement forms a stiffer layer having higher values of F than that of subgrade.

• The surface layer is infinite in the horizontal direction but finite in the vertical direction, and the width of infinite height is finite.

87. A 3.5 m wide slab is having thickness of 25 cm and friction factor (f) is 1.5. The length of slab is 4.5 m and has unit weight of 2400 kg/m stress developed due to seasonal variation is _____ N/mm².

A. 0.06
B. 0.08
C. 0.05
D. 0.07

Ans. B

Sol. Correct option: (B) 0.08
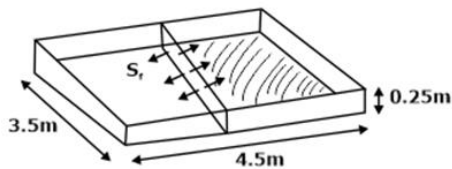
Given:- A slab with

Width, B = 3.5m

Length L = 4.5m

Thickness = 0.25m

Friction factor f = 1.5

Unit weight of concrete = 2500 kg/m²

For obtaining seasonal variation, we need to equate forces at centre of slab.

$$f \times \left(\gamma \frac{L}{2} \times B \times h \right) = B \times h \times S_L$$

$$S_f = \frac{1}{2} \gamma \rho \cdot L$$

$$S_f = \frac{1}{2} \times 2500 \times 1.5 \times 4.5$$

S_f = 8437.5 kg/m²

S_f = 8437.5 × 9.81 N/m² (multiplying by g = 9.81)

S_f = 82771.875 N/m²

$$\boxed{S_f = 0.082 N / mm^2}$$

88. The reception signal is

A. Advanced starter only

B. Starter only

C. None of the other options provided

D. Both Advanced starter and Starter

Ans. C

Sol. Reception signals $\rightarrow$ Other and home signals

Departure signals $\rightarrow$ Starter and advance starter signals

89. The increase in traffic Volume, due to the general increase in the number of transport Vehicles from year to year is known as

A. Normal traffic growth   B. Generated traffic

C. Development traffic   D. Existing traffic

Ans. A

Sol. Normal traffic growth is the rate at which traffic volume is expected in increase each year.

90. Which type of coordinated signal system is not conductive to give continuous movement of all vehicles as given in IRC 93-1985?

A. Flexible progressive system

B. Limited progressive system

C. Simple progressive system

D. Simultaneous system

Ans. D

Sol. Simultaneous system does not give continuous movement.

91. Which one the following has its own prime movers and, thus, is capable of moving freely on the project sites?

A. Tower crane   B. Mobile crane

C. Lift   D. Wheel barrow

Ans. B

Sol. (A) Tower cranes

— It takes very limited area

— lifting capacity is low

— It is a form of balance crane

— Lifting height and good working radius.

(B) Mobile crane:

— It mainly used for railway work and adapted to travel to railway tracks.

— It is mounted on bile units.

— It is suitable for small operations.

(C) Life

— If is fixed at one location to lift weight.

(D) Wheel barrow:

— It is normally used on ground level i.e., mainly in road construction and other similar structures.
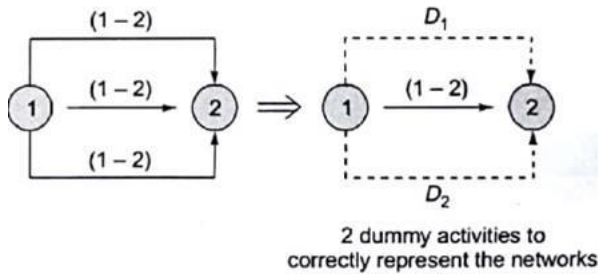
So, mobile crane is correct option.

92. There are three parallel paths in a part of a network between a bursting node and the next merging node with only one activity in each path. The minimum number of dummy arrows needed will be

A. Zero   B. 1

C. 2   D. 3

Ans. C

Sol.

(1 – 2)

2 dummy activities to
correctly represent the networks

93. Sensitivity analysis is a study of

A. Comparison of profit and loss

B. Comparison of assets and liabilities

C. Change in output due to change in input

D. Economics of cost and benefits of the project

Ans. C

Sol. Sensitivity measures how independent variables value will impact a particular dependent value under a given set of assumptions. It basically correlates output change wrt to input change.

94. Latest start of an activity is always

A. greater than or equal to latest event times of all the preceding nodes

B. less than or equal to earliest event times of all the preceding nodes

C. equal to the latest event times of all the preceding nodes

D. equal to the earliest event time of all the preceding nodes

Ans. A

Sol. The succeeding activity can only start when all of the proceeding activities have finished. Hence the latest start time is always greater or equal to latest event time of preceding nodes.

95. If the excavation of earth is done manually then it costs Rs. 80 per m^3. A Machine can excavate at a fixed cost of Rs. 60000 plus a variable cost of Rs. 20 per m^3. The quantity of earth for which the cost of excavation by machine will be equal to the cost by manual excavation is

A. 500 m^3 B. 1000 m^3

C. 1500 m^3 D. 2000 m^3

Ans. B

Sol. Let amount of earth excavated for equal cost with machine excavation and manual excavation be x

$80 x = 60000 + 20 x$

$x = 1000 \, m^3$

96. As per the Building Byelaws, how much should be the marginal distance that is to be left in the front?

A. At least 3 m   B. At least 5m

C. More than 5m   D. More than 10m

Ans. A

Sol. At least 3m marginal distance has to be left in the front of the building according to building byelaws.

97. What is a Mullion in a window shutter?

A. Vertical member running through shutter of window

B. Horizontal member of shutter

C. Inclined battening

D. None of the above

Ans. A

Sol. A mullion is a vertical element that forms a division between units of a window or screen or is used decoratively.

98. The difference between the total float and free float is known as

A. Free float   B. Total float

C. Independent float   D. Interfering float

Ans. D

Sol. Total float F_T = (Maximum time available – Actual time required)

Free float – amount of time by which an activity can be delayed without affecting the succeeding activity.

$F_F = F_T - S_j$

Interfering float = S_j

$F_F = F_T - F_I$

99. To provide safety against piping failure, with a factor of safety of 5, what should be the maximum permissible exit gradient for soil with specific gravity of 2.5 and porosity of 0.35 ?

A. 0.176   B. 0.195

C. 0.882   D. 0.980

Ans. B

Sol.

$$FOS = 5$$
$$n = 0.35$$
$$e = \frac{n}{1-n} = \frac{0.35}{0.65}$$
$$FOS = \frac{i_{cr}}{i}$$
$$\Rightarrow \frac{G-1}{1+e} = \frac{1.5}{1+\dfrac{0.35}{0.65}} = 0.975 = i_{cr}$$
$$i = \frac{i_{cr}}{FOS} = \frac{0.975}{5} = 0.195$$

100. From a flownet which of the following information can be obtained?

1) Rate of flow

2) Pore water pressure

3) Exit gradient

4) Permeability

Select the correct answer using the codes given below:

A. 1,2,3 and 4   B. 1,2 and 3

C. 2,3 and 4 only   D. 1 only

Ans. B

Sol.

- $Q = KH\dfrac{N_t}{N_D}$

- PWP can be measured with the help of equipotential lines and equipotential drops.

- Exit gradient can be obtained by analyzing test blocks of flownet.

- But permeability can't be found out from flownets.

101. Consider the following statements:

1. Dynamic cone penetration test for site investigation is based on the principle that elastic shock waves travel in different material at different velocities.

2. Electrical resistivity method of subsurface investigation is capable of detecting only the strata having different electrical resistivity.

3. In-situ vane shear test is useful for determining the shear strength of very soft soil and sensitive clays and is unsuitable for sandy soil.

Which of these statements is/are correct?

A. 1 and 2   B. 2 and 3

C. 1 and 3   D. 2 alone

Ans. B

Sol. Dynamic Cone Penetration Test (DCPT) is based on shear resistance provided to cone by the soil and not on elastic shock waves.

102. Hygroscopic water is defined

A. The water held by the soil under capillary action

B. The readily available water for the use of plants

C. The water which is absorbed by the particles of dry soil from the atmosphere

D. Total water content of the soil filled with water

Ans. C

Sol. Hygroscopic water is the water absorbed from the atmosphere and held very tightly by the soil particles, so that is unavailable to plants in amounts sufficient for them to survive.

103. A flownet of a cofferdam foundation has 6 flow channels and 18 equipotential drops. The head loss during seepage is 6 m. If the coefficient of permeability of soil is 4×10^{-5} m/min, then the seepage loss (m^3/day) is

A. 72   B. 8

C. 0.115   D. 1.037

Ans. C

Sol. Seepage loss can be calculated as follows

no of flow channel = 6

no of equipotential drops=18

$$Q = K\,i\,A = kH\frac{N_f}{N_D}$$

$$= 4 \times 10^{-5}\frac{m}{min} \times 6\,m \div \frac{6}{18}$$

$$= 8 \times 10^{-5} \times 60 \times 24\ m^2/day$$

$$= 0.115\ m^2/day = 0.115\ m^3/day/m$$

104. A concentrated load of 50 kN acts vertically at a point on the soil surface. If Boussinesq's equation is applied for computation of stress, then the ratio of vertical stresses at depths of 3 m and 5 m respectively vertically below the point of application of load is

A. 0.36   B. 0.60

C. 1.66   D. 2.77

Ans. D

Sol. As per Boussinesq equation,

since pt is below hence r=0
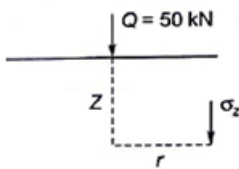
$$\Rightarrow \qquad \sigma_z = \frac{3Q}{2\pi \cdot Z^2} \cdot \left[\frac{1}{1+\left(\frac{r}{z}\right)^2}\right]^{5/2}$$

for   r = 0

$$\sigma_z \propto \frac{1}{Z^2}$$

Now, $\dfrac{\sigma_3}{\sigma_5} = \dfrac{(5)^2}{(3)^2} = \dfrac{25}{9} = 2.77$

105. The intensity of vertical stress at depth z below a concentrated load Q, by Boussinesq equation is:

A. $\sigma_z = 0.5775\dfrac{Q}{Z^2}$ B. $\sigma = 0.4775\,QZ^2$

C. $\sigma_z = 0.4775\dfrac{Q}{Z^2}$ D. $\sigma = 0.5775\,QZ$

Ans. C

Sol. According to Boussinesq, vertical stress at depth z and radial distance r from a point load Q is given as

$$\sigma_z = \frac{3Q}{2\pi z^2}\left[\frac{1}{1+\left(\frac{r}{z}\right)^2}\right]^{5/2}$$
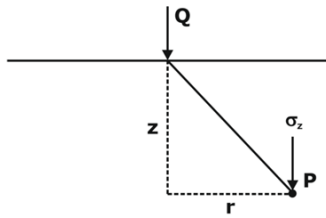
For $r = 0, \sigma_z = \dfrac{3Q}{2\pi z^2} = 0.4775 \dfrac{Q}{z^2}$

106. An important hydraulic failure of earth dams is

    A. Piping

    B. Sloughing

    C. Upstream slope failure due to sudden drawdown

    D. Overtopping

Ans. D

Sol. Important hydraulic failure of earth dams are:

    i. Sliding ii. Overtopping

    iii. Crushing

107. The collapsible soil is associated with

    A. Dune sands   B. Laterite soils

    C. Loess   D. Black cotton soils

Ans. C

Sol. Loess soil is associated with collapsible nature.

108. A layer of soil having $G = 2.67$ and $e = 0.67$ is subjected to an upward head of 1.5 m due to seepage of water. The depth of the soil layer required to provide a factor of safety 2 against piping is

    A. 1.5 m   B. 2.0 m

    C. 3.0   D. 0.75 m

Ans. C

Sol. G = 2.67

    e = 0.67

    Critical hydraulic gradient

    $\dfrac{G-1}{1+e} = \dfrac{2.67-1}{1+0.67} = 1$

    $FOS = \dfrac{i_{cr}}{i}, i = \dfrac{1.5\ m}{d}$

    $2 = \dfrac{1}{\left(\dfrac{1.5}{d}\right)}$

    $d = 2 \times 1.5 = 3\ m$

109. A soil has an angle of shearing of 30° and cohesion of 35 kN/m². If the specimen of this soil is subjected to a tri-axial compression test, then the value of lateral pressure in the cell for failure to occur at total stress of 300 kN/m² will be

    A. 243.21 kN/m²   B. 44.41 kN/m²

    C. 103.21 kN/m²   D. 59.59 kN/m²

Ans. D

Sol.

$$\sigma_1 = \sigma_3 \tan^2\left(45 + \frac{\phi}{2}\right) + 2C \tan\left(45 + \frac{\phi}{2}\right)$$

Given, $\phi = 30°$

$C = 35$ kPa

$\sigma_1 = 300$ kPa

$\sigma_3 = ?$

$$300 = \sigma_3 \tan^2\left(45 + \frac{30}{2}\right) + 2 \times 35 \tan\left(45 + \frac{30}{2}\right)$$

$$300 = \sigma_3 \times 3 + 70\sqrt{3}$$

$\Rightarrow$ $\sigma_3 = 59.59$ kN/m²

lateral pressure required is 59.59MPa

110. If S is the shear strength, C is cohesion and φ is angel of internal friction, σ is the normal stress at failure, then coulomb's equation for shear strength of the soil can be represented by

A. C = S − σ tan φ   B. S = C − σ tan φ

C. C = S + σ tan φ   D. S = σ + C tan φ

Ans. A

Sol. Coulomb's equation for shear strength of the soil is given as

S = C + σ tan φ

or C = S − σ tan φ

111. Black cotton soil exhibits large swelling and shrinkage due to the presence of the following clay mineral :

A. Kaolinite   B. Illite

C. Montmorillonite   D. Halloysite

Ans. C

Sol. • Black cotton soil exhibits large swelling and shrinkage due to the presence of the Montmorillonite.

- Several structural units in montmorillonite are joined by weak water bond which can be easily displaced. Hence, the soils having montmorillonite minerals show large swelling and shrinkage characteristics depending upon the nature of exchangeable cation

112. A normally consolidated clay layer settles by 25 mm when the effective stress is increased from 15 kPa to 30 kPa. If the effective stress is later increased further from 30 kPa to 60 kPa, then the additional settlement would be:

A. 25 mm   B. 50 mm

C. 75 mm   D. 100 mm

Ans. A

Sol. The formula for calculating the settlement is given as,

$$\Delta H = \frac{H_0 C_c}{1+e} \, log \frac{\sigma_1}{\sigma_0}$$

Where, C_c = Compression index

$$\Delta H_1 = \frac{H_0 C_c}{1+e} \, log \frac{30}{15}$$

$$\Delta H_2 = \frac{H_0 C_c}{1+e} \, log \frac{60}{15}$$

$\Delta H_2 = 2 \, \Delta H_1$

Therefore, Additional settlement = $\Delta H_2 - \Delta H_1$ = 25 mm

113. The temperature of soil sample shall not be increased beyond ____C° while determining water content by over drying method.

{Note: - The give soil contains organic matter}

A. 60°C   B. 80°C

C. 110°C   D. 105°C

Ans. A

Sol. In oven drying method_-

If soil contains organic matter temperature shall not be increased beyond 60 degree. If soil contains Gypsum temperature shall not be increased beyond 80 degree. In any case temperature shall not be increased beyond 10 degrees (Temp above 110 degrees leads to loss of structural water)

114. A liquid with specific gravity of 0.85 undergoes a reduction in volume 0.18% when subjected to an increase in pressure of 2000 kPa. The velocity of propagation of sound in this liquid is

A. 1143.27 m/s   B. 1195.12 m/s

C. 1218.20 m/s   D. 1268.70 m/s

Ans. A

Sol.

$$\frac{-\Delta V}{V} = 0.18\% = 0.0018$$

ΔP_p = 2000 kPa

$$k = \frac{-\Delta P}{\left(\frac{\Delta V}{V}\right)} = \frac{2000}{0.0018} = 1.111 \times 10^6 kPa$$

$= 1.111 \times 10^9$ Pa

$$C = \sqrt{\frac{k}{\rho}} = \sqrt{\frac{1.111 \times 10^9}{0.85 \times 1000}} = 1143.27 m/s$$

115. In a laminar boundary layer, the velocity distribution can be assumed to be given, in usual notations, as

$$\frac{u}{v} = \frac{y}{g}$$

Which one of the following is the correct expression for the displacement thickness (δ*) for this boundary layer?

A. δ* = δ

B. δ* = δ/2

C. δ* = δ/4

D. δ* = δ/6

Ans. B

Sol.

$$\delta^* = \int \left(1 - \frac{U}{V}\right) dy = \delta \int_0^1 (1 - \eta) d\eta$$

Where η = y/δ

δ* = δ/2

116. A right angles V-notch is used for measuring a discharge of 20 l/s. An error of 0.9 mm was made while measuring the head over the notch. Take c_d = 0.60, percentage error in discharge measurement would be:

A. 1.18%   B. 1.24%

C. 1.44 %   D. 1.52%

Ans. B

Sol. Let head over V-notch H

Discharge θ through a triangular notch is given by

$$Q = \frac{8}{15} c_d \times tan\left(\frac{\theta}{2}\right) \times \sqrt{2g} \times H^{5/2}$$

Q= 0.02 m³/s , C_d=0.6 , g=9.81 m/s² and θ=90⁰

Solving we get, H=0.182 mm = 182 mm

dQ/Q= 5/2 x dH/H

= 2.5 x 0.9/182 x 100 = 1.236 %

117. The flow in a river is 1800 cumecs. A distorted model is built with horizontal scale of 1/100 and vertical scale of 1/25.The flow rate in the model should be

A. 0.36 cumecs

B. 0.144cumecs

C. 0.19 cumecs

D. 0.24 cumecs

Ans. B

Sol. $Q_r = A_r V_r$

Froude model law, $V_r = \sqrt{L_r} = \sqrt{\left(\frac{1}{25}\right)} = 1/5$

$A_r = L_r B_r = (1/25) \times (1/100) = 1/2500$

$Q_r = (1/2500) \times (1/5) = Q_m/1800$

$Q_m = 0.144$ cumecs

118. The difference in pressure between the inside and outside of a soap bubble was observed to be 1.6 N/m². If the surface tension of the liquid is 40 dyne/cm, what will be the diameter of the bubble in meters?

A. 0.025

B. 0.05

C. 0.1

D. 0.2

Ans. D

Sol. Given, $\Delta p = 1.6$ pa

σ = 40 dyne/cm = 0.04 N/m

for soap bubble, $\Delta p = \dfrac{8\sigma}{D}$

$\Rightarrow D = \dfrac{8\sigma}{\Delta p} = 0.2\,m$

119. A rectangular opening in a vertical side of tank has been provided opening is completely covered by plane plate hinged along horizontal centre line of the opening plate is kept in equilibrium in vertical position by a weight W as shown in figure. Value of W (in kN) would be (Neglect friction at hinge and pulley)
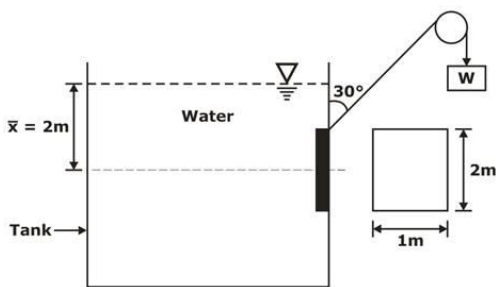
A. 13.1 kN

B. 18.6 kN

C. 27.5 kN

D. 39.8 kN

Ans. A

Sol. Total thrust exerted on plate,

$P = w \cdot A \cdot \bar{X}$ = 1000 × 9.81 × 2 × 1 × 2 = 39240 N

Position of centre of pressure,

$\bar{h} = \dfrac{I_G}{A\bar{X}} + \bar{X}$

I_G = moment of inertia of plate about axis passing through G

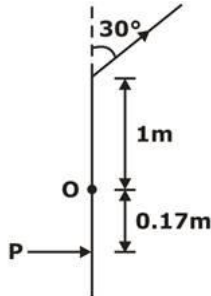$$= \frac{bd^3}{12} = \frac{1 \times (2)^3}{12} = \frac{8}{12} = \frac{2}{3}m^4$$

$A = b.d = 1 \times 2 = 2m^2$

So, $\bar{h} = \dfrac{2}{3 \times 2 \times 2} + 2 = 2.166\,m$

Taking moment of forces about O

$39240 \times 0.166 = W \times 1000 \times \cos 60$

$\Rightarrow W = 13.04\ kN \simeq 13.1\ kN$

120. Statement (I): Centre of pressure for a vertical surface submerged in a liquid lies below the centroid (centre of gravity) of the vertical surface :

Statement (II): As depth of submergence increases, the centre of pressure approaches the centroid.

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 (I) are individually true, but statement (II) is NOT the correct explanation of statement (I).

C. Statement (I) is true, but statement (II) is false

D. statement (I) is false, but statement (II) is true

Ans. B

Sol. Statement (I) : Centre of pressure

$$\bar{h} = h + \frac{I_g \sin^2 \theta}{A.h}$$

So, centre of pressure $(\bar{h})$ will always lie below centroid (h) $\rightarrow$ correct

Statement (II) : As depth of submergence increases i.e. h ↑,

Centre of pressure approaches centroid and for very large depth i.e. h $\rightarrow \infty$, $\bar{h}$ =

h $\rightarrow$ correct

121. The pressure gradient in the direction of flow is equal to the

A. shear gradient parallel to the direction of flow

B. shear gradient normal to the direction of flow

C. velocity gradient parallel to the direction of flow

D. velocity gradient normal to the direction of the flow

Ans. B

Sol.

$$\frac{dp}{dx} = \frac{d\tau}{dy}$$

This is Navier-Stokes' equation for steady incompressible flow.

122. The appropriate percentage of water in sewage is

A. 90%   B. 99%

C. 99.90%   D. 99.99%

Ans. C

Sol. Domestic sewage is slightly more than 99.9 percent pure water by weight. The rest, less than 0.1 percent, contains a wide variety of dissolved and suspended impurities. Although amounting to a very small fraction of the sewage by weight, the nature of these impurities and the large volumes of sewage in which they are carried make disposal of domestic wastewater a significant technical problem.

123. The most economical circular channel gives maximum discharge while:

A. depth of water = 0.95 diameter of circular section

B. hydraulic mean depth = 0.286 diameter of circular section

C. wetted perimeter = 2.6 diameter of circular section

D. All of the above.

Ans. D

Sol. All the given statements are correct.

In case of circular channels, for the most economical section, two separate conditions are obtained:

1) condition for maximum discharge, and

2) condition for maximum velocity.

1) Most economical section of a circular channel for **maximum discharge** is if

a. Depth of water = **0.95** diameter

b. Hydraulic mean depth = 0.286 diameter

c. Wetted perimeter = 2.6 diameter

2) Most economical section of a circular channel for **maximum velocity** is if

a. Depth of water = **0.81** diameter

b. Hydraulic mean depth = 0.304 diameter

c. Wetted perimeter = 2.245 diameter

124. The device used for the easy separation of dry dust of 5 to 25 μm size is _____.

A. cyclone

B. gravity settling chamber

C. bag filter

D. scrubber

Ans. A

Sol. A **cyclonic separation** is a method of removing particulates from an air, gas or liquid stream, without the use of filters, through vortex**separation**. When removing particulate matter from liquids, a**hydrocyclone** is used; while from gas, a gas **cyclone** is used.

125. Good quality sand is never obtained from

A. river   B. lake

C. sea   D. gravel powder

Ans. C

Sol. It contains salt content

126. Which among the following ecosystem have inverted biomass pyramid?

A. Marine ecosystem

B. Grassland ecosystem

C. Both marine and grassland ecosystems

D. Neither marine nor grassland ecosystem

Ans. A

Sol. Only Marine ecosystem have inverted biomass pyramid.

127. What is the maximum permissible limit of fluoride in drinking water?

A. 1.2 mg/l   B. 1.5 mg/l

C. 3.0 mg/l   D. 0.5 mg/l

Ans. B

Sol. Maximum permissible limit of fluoride = 1.5 mg/l

Acceptable limit of fluoride= 1 mg/l

128. For a grit channel, if the recommended flow velocity is 0.25 m/s and the detention period is 1 minute, then length of the tank is:

A. 15 m   B. 25 m

C. 32.5 m   D. 40 m

Ans. A

Sol. Length = Flow velocity x Detention time

Length = 0.25 x 60

Length = 15 m

129. The following data pertain to a waste water sample

Initial Dissolved oxygen = 10 mg/l

Final Dissolved oxygen = 3 mg/l

Dilution = 2 %

The Biochemical oxygen demand of the given wastewater sample is:

A. 250 mg/l   B. 500 mg/l

C. 300 mg/l   D. 350 mg/l

Ans. D

Sol. Biochemical oxygen demand (B.O.D) = $(DO_i - DO_f)$ x Dilution Ratio

B.O.D = $(10 - 3)$ x $\frac{100}{2}$

B.O.D = 350 mg/l

130. A drain carrying sewage of BOD = 200 mg/l and flow rate of 50 m^3/s joins a river whose upstream BOD is 10 mg/l and flow rate is 500 m^3/s. Assume immediate and complete mixing of drain with the river. What is the estimated downstream BOD of the river flow?

A. 20.4 mg/l

B. 25.54 mg/l

C. 104.4 mg/l

D. 27.27 mg/l

Ans. D

Sol.

$$BOD_{mix} = \frac{Q_S BOD_S + Q_R BOD_R}{Q_S + Q_R} = \frac{50 \ x \ 200 + 500 \ x \ 10}{50 + 500} = 27.27 \ mg/l$$

131. Raw water is entering a treatment plant and contains 250 mg/l suspended solids. If 55% of these solids are removed in sedimentation then find the solids removed in sedimentation as sludge?

A. 144.5 mg/l

B. 141.6 mg/l

C. 137.5 mg/l

D. 135.5 mg/l

Ans. C

Sol. Suspended solids in waste water = 250 mg/l

Since 55% of these solids are removed in sedimentation, we have

The solids removed in sedimentation as sludge = 0.55 x 250 mg/l = 137.5 mg/l

132. A grit chamber of dimension 15 m x 2 m x 0.8 m liquid depth flow of 800 m^3/hr. Its detention time is

A. 0.6 minute

B. 1.2 minutes

C. 1.5 minutes

D. 1.8 minutes

Ans. D

Sol. Discharge, Q = 800 m^3/hr

Chamber dimension = 15 m x 2 m x 0.8 m

Volume of grit chamber, V = 15 x 2 x 0.8 = 24

Detention time, $T = \frac{V}{Q} x60 = \frac{24}{800} x60 = 1.8 \ minutes$

133. Biochemical oxygen demand is quoted at what temperature?

A. 25^0C

B. 20^0C

C. 15^0C

D. 10^0C

Ans. B

Sol. Standard BOD is measured at 20^0C – 5 day.

134. In a field test of a formation having a porosity of 20%, the hydraulic gradient was found to be 0.04, and the velocity of a tracer added to the groundwater was 2 mm/s. The permeability of the aquifer is

A. 1 cm/s

B. 4 cm/s

C. 0.1 cm /s

D. 0.4 cm /s

Ans. A

Sol. Apparent or discharge velocity = V

Actual speed of travel in the pores, V_a = 2 mm/s

Porosity of formation, n = 0.20

Hydraulic gradient, I = 0.04

$V = nV_a$

$V = 0.20 \times 2 = 0.4\, mm/s$

Permeability, $K = \dfrac{V}{i}$

$K = \dfrac{0.4}{0.04}$

$K = 10\, mm/s\, or\, 1\, cm/s$

135. A unit hydrograph has

    A. One unit of time base of direct runoff.

    B. One unit of rainfall duration.

    C. One unit of direct runoff.

    D. One unit of peak discharge.

Ans. C

Sol. The unit hydrograph of a drainage basin is defined as a hydrograph of direct runoff resulting from 1cm of effective rainfall applied uniformly over the basin area at a uniform rate during a specified period of time.

136. A triangular DRH due to a storm has a time base of 100h and a peak flow of 100 m^3/s, occurring at 20h from the start. If the catchment area is 360 km^2, the rainfall excess in the storm was

    A. 10 cm   B. 0.1 cm

    C. 5 cm   D. 0.05cm

Ans. C

Sol.

Excess rainfall depth $= \dfrac{Volume\ of\ runoff}{Catchment\ area} = \dfrac{Area\ of\ DRH}{Catchment\ area}$

$= \dfrac{\frac{1}{2} \times 100 \times 3600 \times 100}{360 \times 10^6} = 0.05m = 5cm$

137. The volume of atmosphere moisture is 12900 km^3 and the flow rate of precipitation is 577000 km^3/yr. Find the residence time of moisture?

    A. 10.4 days   B. 9.6 days

    C. 8.2 days   D. 7.5 days

Ans. C

Sol. Storage of water in form of moisture S = 12900 km^3

Flow of water as precipitation Q = 577000 km^3/yr

So, the residence time is $T_r = \dfrac{S}{Q} = \dfrac{12900}{577000} = 0.022\ year = 8.2\ days$

138. Lysimeter is used to meaure:

    A. Infiltration   B. Evaporation

    C. Evapotranspiration   D. Vapour pressure

Ans. C

Sol. A lysimeter is a special water tight tank containing a block of soil and set in a field of growing plants. The plants grown in the lysimeter are same as in the surrounding field. Evapotranspiration is estimated in terms of the amount of water required to maintain constant moisture conditions within the tank, measured by an arrangement made in lysimeter.

139. The ratio of runoff to rainfall is called:

    A. Rainfall coefficient   B. Runoff coefficient

    C. Infiltration coefficient   D. Distribution coefficient

Ans. B

Sol. The runoff coefficient (C) is a dimensionless coefficient relating the amount of runoff to the amount of precipitation received. It is a larger value for areas with low infiltration and high runoff (pavement, steep gradient), and lower for permeable, well vegetated areas (forest, flat land)

140. The basic assumptions of unit hydrograph theory are:

    A. Nonlinear response and time invariance

    B. Time invariance and linear response

    C. Linear response and linear time variance

    D. nonlinear time variance and linear response

Ans. B

Sol. Assumptions which constitute in the foundation for the unit hydrograph theory

    i) Time invariance = The runoff produced from a given drainage basin due to a given effective rainfall, shall always be the same irrespective of the time of its occurrence.

    ii) Linear response = The direct runoff response to the rainfall excess is assumed to be linear. Hence if a 4 hour unit hydrograph due to 1 cm rainfall is given, then a 4 hour hydrograph due to 2 cm rainfall would just mean doubling the unit hydrograph ordinate.

141. A canal is 80 km long and has an average width of 15 m. A USWB class A pan installed near the canal indicated an evaporation of 5 mm/day. The volume of water evaporated from this canal in a month of 30 days would be _____ hectare?

    A. 10.6 ha-m   B. 12.6 ha-m

    C. 14.9 ha-m   D. 19.4 ha-m

Ans. B

Sol. Volume $V_E = A \times C_p \times E_p$

    $V_E = 80 \times 1000 \times 15 \times 0.7 \times \dfrac{5}{1000} \times 30$

    $V_E = 126000 \ m^3$

    $V_E = 12.6 \ ha\text{-}m$

142. What is the thickness of floor of the weir shown below in figure, if the relative density of the concrete is 2.5 and uplift pressure head is 2m?

A. 0.52 m   B. 0.63 m

C. 0.74 m   D. 0.80 m

Ans. D

Sol. Total uplift force = 2 x (γ_w) x 20 x 1

Thickness of floor = $\dfrac{F_{uplift}}{Area \times \gamma_{concrete}} = \dfrac{2 \times \gamma_w \times 20 \times 1}{20 \times 1 \times \gamma_w \times 2.5}$ = 0.8 m

143. A certain crop is grown in an area of 2000 hectares, which is fed by a canal system. The data pertaining to irrigation are as follows:

Field capacity of soil = 25%; Optimum moisture = 10%; Permanent wilting point = 8%;

Effective Depth of root zone = 75cm; Apparent relative density of soil = 1.4.

If the frequency of irrigation is 10 days and the overall irrigation efficiency is 20% then water discharge required in the canal, feeding the area, is

A. 18.23 m^3/sec   B. 20.66 m^3/sec

C. 24.79 m^3/sec   D. 36.45 m^3/sec

Ans. A

Sol. Depth of water used by plants for growth, which is supplemented by irrigation after every

10 days = $\dfrac{\gamma_d}{\gamma_w} \times d \times (FC - OMC)$

$= \dfrac{1.4}{1} \times 75 \times (0.25 - 0.10)$ = 15.75 cm

Daily consumptive use = $\dfrac{15.75}{10}$ = 1.575 cm

Total irrigation water required i.e. losses in field and conveyance = $\dfrac{N.I.R.}{\eta_{irrigation}}$

$= \dfrac{1.575}{0.20}$ = 7.875 cm/day

Discharge required in irrigation canal = $\dfrac{7.875 \times 2000 \times 10^4}{100 \times 24 \times 60 \times 60}$ = 18.23 m^3/sec

144. Statement 1: A plant will wither permanently if the water content falls below permanent wilting point.

Statement 2: The water content in the soil below permanent wilting point is zero.

A. Both statements are true and statement 2 is the correct statement of statement 1

B. Both statements are true but statement 2 is not the correct statement of statement 1

C. Statement 1 is true, statement 2 is false.

D. Statement 1 is false, statement 2 is true.

Ans. C

Sol. The water below the permanent wilting point is hygroscopic water. No water can be extracted below this point for the growth of plants.

145. A Persian wheel with an average discharge of 230 litre/minute irrigates 1 hectare wheat crop in 50 hours. The average depth of irrigation will be nearly

A. 4 cm   B. 5 cm

C. 6 cm   D. 7 cm

Ans. D

Sol.

$$\text{Avg. depth of irrigation} = \frac{\text{Discharge} \times \text{time}}{\text{Area}} \quad \therefore \quad \text{Avg. depth of irrigation} = \frac{230 \times 10^{-3} \times 50 \times 60}{10^4} \times 10^2$$

Average depth = 6.9 cm.

146. The coefficient of variation of the rainfall for six rain gauge stations in catchments was found to be 29.54%. the optimum number of stations in the catchments for an admissible 10% error in the estimation of the mean rainfall will be

A. 3   B. 6

C. 9   D. 12

Ans. C

Sol. The number of optimum stations can be given as

$$N = \left(\frac{C_v}{\varepsilon}\right)^2 = \left(\frac{29.54}{10}\right)^2$$

= 8.72 = 9 Stations

147. What would be the volume of water stored in a saturated Colum with a porosity of 0.35 with a cross-sectional area of $1m^2$ and depth of 3 m?

A. 2.0 m^3 B. 0.105m^3

C. 1.05m^3 D. 3.0m^3

Ans. C

Sol. Volume of water stored

= 0.35 × 3 × 1 = 1.05m^3

148. A graph between the pressure head in the cylinder and the distance travelled by the piston from inner dead centre for one complete revolution of crank in known as

A. Slip diagram   B. Crank diagram

C. Polar diagram   D. Indicator diagram

Ans. D

Sol. Indicator diagram shows variation of pressure head with stroke length.
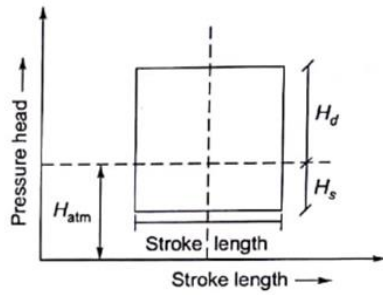
149. The power channel that extends from the intake works to the power house is called:

A. Head race
B. Penstock

C. Diversion canal
D. None of these

Ans. A

Sol. The power channel that extends from the intake works to the power house is head race.

150. An inward flow reaction turbine:

A. Impulse turbine
B. Francis turbine

C. Pelton turbine
D. All the above

Ans. B

Sol. Impulse turbine – Pelton turbine

Inward flow reaction turbine – Francis turbine

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