Rajasthan RVUNL 2021

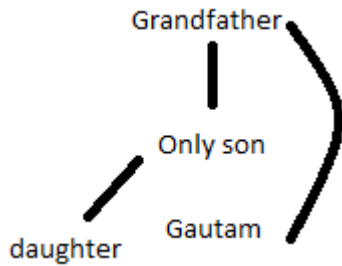## Civil Engineering

Mini Mock Challenge
(April 3- April 4 2021)

Questions & Solutions

1.   Pointing to Gautam, Nandani says, "I am the daughter of the only son of his grandfather."
      How Nandani is related to Gautam?

      A. Niece   B. Daughter

      C. Sister   D. Cannot be determined.

Ans. C

Sol.

      Nandani is the daughter of the only son of Gautam's grandfather. Hence, it is clear that
      Nandani is the sister of Gautam.

2.   In the following question, select the related word from the given alternatives.

      palaeontology : Fossil : : Phrenology : ?

      A. Skull   B. Pancreas

      C. Thyroid   D. Lungs
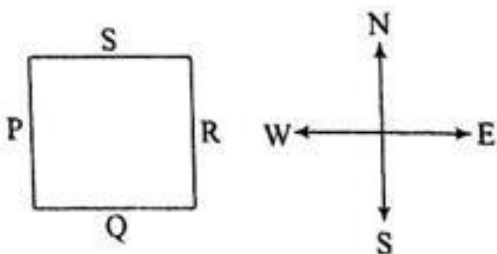
Ans. A

Sol. Palaeontology is the study of fossils. Similarly, Phrenology is the study of the size and shape
      of the skull.

      Hence, option A is the correct response.

3.   P, Q, R and S are playing carrom. P and R are partners, S and Q are partners. S is sitting
      to the right of R who faces west, then Q faces which direction?

      A. South   B. East

      C. West   D. North
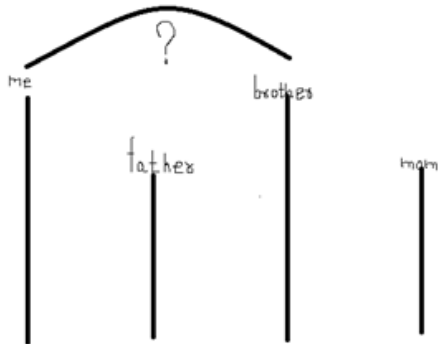
Ans. D

Sol.

      Q is facing North.

      Hence, option D is correct.

4.   I am taller than my father, my father is not taller than my brother and my mother is not taller than my brother. Who is the tallest?

A. me   B. brother

C. mother   D. data inadequate

Ans. D

Sol.   data is incomplete because heights of brother and me are not mentioned.

Hence, option D is the correct answer.

5.   Janpad Panchayat works at which level?

A. Village Level   B. District Level

C. Division Level   D. Block Development Level

Ans. D

Sol.   In Madhya Pradesh, **three-tier Panchayati Raj system** is implemented, where **gram panchayat** at **village level**, j**anpad panchayat** at **development block leve**l and **district panchaya**t is functioning at the **district level**. Hence the area comes under the **Janpad panchayat** is a **development block.**

6.   Three crops that contribute maximum to global food grain production are _____

A. wheat, rice, barley   B. rice, maize, sorghum

C. wheat, maize, sorghum   D. wheat, rice, maize

Ans. D

Sol.   Wheat, rice, maize contribute maximum to global food grain production.

7.   Reverse Repo Rate and Base Rate are formulated by_____

A. SBI   B. SEBI

C. RBI   D. Government of India

Ans. C

Sol.   • Reverse Repo Rate and Base Rate are formulated by Reserve Bank of India.

• Reverse repo rate is the rate of interest at which the RBI borrows funds from other banks in the short term.

• Base rate is the minimum rate set by the Reserve Bank of India below which banks are not allowed to lend to its customers

8. Who was the first Indian to be elected as a Member of the British House of Commons?

    A. Jayaprakash Narayan   B. Dada Bhai Naoroji

    C. Ram Manohar Lohia   D. Sarojini Naidu

Ans. B

Sol. Dadabhai Naoroji (4 September 1825 – 30 June 1917), known as the Grand Old Man of India, was a Parsi intellectual, educator, cotton trader, and an early Indian political and social leader.

   • He was a Liberal Party member of parliament (MP) in the United Kingdom House of Commons between 1892 and 1895, and the first Asian to be a British MP.

9. Who was the founder of the Indian Reform Association in 1870?

    A. Debendranath Tagore   B. Keshub Chandra Sen

    C. Rammohan Roy   D. Dayanand Saraswati

Ans. B

Sol. The Indian Reform Association was formed on 29 October 1870 with Keshub Chunder Sen as president. It represented the secular side of the Brahmo Samaj and included many who did not belong to the Brahmo Samaj.

10. In respect of which type of bills, the President of India has no veto power?

    A. Money Bills   B. Constitutional Amendment Bills

    C. Financial Bills   D. Ordinary Bills

Ans. B

Sol. 1. The **President** of **India** has **no veto power** in respect of a **Constitutional Amendment Bill**. The **24th Constitutional Amendment Act of 1971** made it **obligatory** for the President to give his **assent** to a Constitutional Amendment Bill.

   2. The power of **withholding** a bill sent for assent of the President is called **veto power** of the President. Different type of veto powers have been provided to the President of India by the Indian Constitution which are in the form of **Absolute, Suspensive** and **Pocket** veto.

11. The number of parliamentary seats (Lok Sabha) of Maharashtra is _____.

    A. 10   B. 26

    C. 28   D. 48

Ans. D

Sol. • The number of parliamentary seats (Lok Sabha) of Maharashtra is **48.**

   • Maharashtra has a bicameral legislature.

   • The major contenders in the state are the United Progressive Alliance (UPA) and National Democratic Alliance (NDA).

12. Silvasa is the capital of which of the following Union Territory of India?

    A. Daman & Diu   B. Lakshadweep

    C. Puducherry   D. Dadra & Nagar Haveli

Ans. D

Sol. **Silvassa** is the capital of the Indian Union Territory of **Dadra and Nagar Haveli**. During Portuguese rule, Silvassa was also known as **Vila de Paço d'Arcos**, after the town of the same name near **Lisbon**.

The city has a large number of **factories** and **industries** providing significant government revenue, which allows the city to maintain a low level of **taxation**.

13. SHINYUU Maitri-18 is a bilateral exercise started in which of the following city?

   A. Noida   B. Agra

   C. Varanasi   D. Ghaziabad

Ans. B

Sol. • SHINYUU Maitri-18 is a bilateral exercise between India and Japan from .from 03 Dec - 07 Dec 18

   • It is started in **Agra.**

14. In which district of Uttar Pradesh Adani Group have set up a 50 MW solar photovoltaic plant?

   A. Mahoba   B. RaeBareli

   C. Amethi   D. Saharanpur

Ans. A

Sol. • Infrastructure conglomerate Adani Group had set up **50 megawatts (MW) solar photovoltaic (PV) plant in Mahoba**, Uttar Pradesh.

   • The plant has been set up with an investment of Rs. 315 crore, under the National Solar Mission Scheme.

15. GEF, an international aid-giving agency has the full form:

   A. Global Economic Fund   B. Global Educational Fund

   C. Global Environment Facility   D. Global Energy Fund

Ans. C

Sol. • The full form of GEF is **Global Environment Facility.**

   • The Global Environment Facility (GEF) was established on the eve of the 1992 Rio Earth Summit to help tackle our planet's most pressing environmental problems.

16. What was the theme of the International Women's Day 2019?

   A. Re-Thinking Women's Empowerment and Gender Equality

   B. Think Equal, Build Smart, Innovate for Change

   C. Press for Progress

   D. Equality for Women is Progress for All

Ans. B

Sol. • The International Women's Day is celebrated on **8 March every year.**

   • "Think Equal, Build Smart, Innovate for Change" is the theme of International Women's Day.

17. Krivoy-Rog has rich resources of

A. Manganese   B. Coal

C. Iron-ore   D. Copper

Ans. C

Sol. • Krivoy-Rog has rich resources of Iron ore.

• The city is a large industrial center, the center of the Kryvyi Rih iron ore basin.

• The total explored reserves of iron ore are over 32 billion tons.

18. Which animal has three eyes in the world?

A. Octopus   B. Tuatara

C. Cockroach   D. Crocodiles

Ans. B

Sol. • **Tuatara animal has three eyes in the world.**

• The lizard-like reptile tuatara has a "well-developed parietal eye, with a small lens and retina".

• Parietal eyes are also found in lizards, frogs and lampreys, as well as some species of fish, such as tuna and pelagic sharks, where it is visible as a light-sensitive spot on top of their head.

19. Who is known as the father of modern chemistry?

A. Amedeo Avogadro   B. Joseph Priestley

C. Antoine Lavoisier   D. John Dalton

Ans. C

Sol. • **Antoine Lavoisier** is considered the **father of modern chemistry**. He was a French nobleman and chemist who recognized and named **oxygen** and **hydrogen** (1783).

• He played a central role in the **18th**-century **chemical revolution** and had a large influence on both the **history of chemistry** and the history of **biology**.

• He predicted the existence of **silicon** (**1787**) and established that **sulfur** was an **element** (**1777**) rather than a **compound**. He discovered that, although **matter** may change its **form** or **shape**, its **mass** always remains the same.

20. Which one of the following catalyst is used for hydrogenation of vegetable oils?

A. Zinc dust   B. Nickel

C. Platinum   D. Copper

Ans. B

Sol.

21. The ratio of relative velocity of sepration after collision to the velocity of approach before collision is called_____.

A. Inelastic collision   B. Elastic collision

C. Coefficient of Restitution resilience D. None of these

Ans. C

Sol. • The **coefficient of restitution** (e) is defined as the ratio of the relative velocity of collision after separation to the relative velocity of approach before collision.

• The **coefficient of restitution** depends to a large extent on the nature of the two materials of which the colliding objects are made.

• It is also affected by the impact velocity, the shape and size of the colliding objects, the location on the colliding objects at which the collision occurs, and their temperatures

22. If the mass of an object is 60 kgs, what will be its weight on the moon? (N=Newton)

A. 60N   B. 600N

C. 98N   D. 10N

Ans. C

Sol. Given mass = 60 kg

As we know,

Weight= mass × acceleration due to gravity

Weight on the earth=60×9.8= 588

On moon the gravity is approx 1/6 as compared to earth that is 9.8/6 m/s^2

Weight of that object on moon = 588 × 1/6 = 98 N

23. Which is the primitive gharana of Kathak style of dance?

A. Lucknow   B. Banaras

C. Jaipur   D. Alwar

Ans. C

Sol. Kathak dance is the classical dance of Rajasthan. This dance originated from Jaipur city of Rajasthan; hence, the Jaipur Gharana is called the primitive / old Gharana of this dance. The originator of this dance was Bhanuji Maharaj. The second / new gharana of this dance is Lucknow. Due to the tradition of performing this dance on auspicious occasion, it is also called Mangal Mukhi dance.

24. Which of the following statements is not correct regarding Mahatma Gandhi Adarsh Gram Yojana?

A. The scheme was launched on 27 November 2019 to mark the 100th birth anniversary of Mahatma Gandhi.

B. Under this scheme, 1 village in each district is to be selected and developed according to Gandhian values.

C. The objective of this scheme is to develop an atmosphere of goodwill.

D. The main activities of this scheme are population control, child health, establishment of de-addiction society, education and skill training programs, etc.

Ans. A

Sol. The scheme launched on 27 November 2019 to mark the 150th birth anniversary of Mahatma Gandhi. Under this scheme, 1 village in each district to be selected and developed according to Gandhian values. The objective of this scheme is to develop an atmosphere of goodwill. The main activities of this scheme are population control, child health, establishment of de-addiction society, education and skill training programs, etc.

25. Which of the following is not a breed of buffalo?

A. Murrah   B. Badawari

C. Jaffarabadi   D. Kankarej

Ans. D

Sol. Rajasthan hold the second place in the country in terms of buffalo dynasty. The main breeds of buffalo are Murrah, Badawari, Surti, and Jaffarabadi. Murrah is the best breed of buffalo. The buffalo-breeding center is located in Vallabhnagar.

Kankarej is breed of cow.

26. Who started the publication of a weekly magazine called Naveen Rajasthan?

A. Vijay Singh Pathik   B. Hiralal Shastri

C. Jaynarayan vyas   D. Pratap Singh Barhat

Ans. A

Sol. The Rajasthan Seva Sangh started a weekly publication from Ajmer called Naveen Rajasthan, whose publisher was Vijay Singh Pathik. Vijay Singh Pathik led the Bijolia and Bengu peasant movement. He is called the father of the peasant movement in India. He founded the Veer Bharat Samaj and edited newspapers like Rajasthan Kesari, Naveen Rajasthan / Tarun Rajasthan, etc.

27. Who was the first ruler of Gurjar-Pratihara dynasty?

A. Nagabhatta I   B. Banbhatta

C. Vasudev   D. Mihir Bhoj

Ans. A

Sol. Nagabhatta was the first ruler of the first Gurjara Pratihara dynasty and the de facto founder of the Gurjara Pratihara Empire. We get this information from the Aihole inscription of the Chalukya king Pulakeshian II and Harshacharit composed by Banabhatta.

28. Which of the following is not the work and responsibility of Rajasthan Public Service Commission?

A. Recruitment on vacant posts and newly created posts of all services like administrative, police, accounts, cooperative of the state

B. Conducting examinations for appointment to state services

C. To advise the State Government regarding disciplinary action taken against an employee

D. Recruitment in selected services by promotion

Ans. D

Sol. **Functions and responsibilities of Rajasthan Public Service Commission:**

i. Recruitment on vacant posts and newly created posts of all services like administrative, police, accounts, cooperative of the state

ii. Recruitment by promotion in *all services*

iii. To advise the State Government regarding the policy of transfer, posting, compensation, expenses, etc., for the judicial matter

iv. The Commission annually sends to the Governor all the details of its various activities, such as recruitment, promotion, seniority, determination, disciplinary proceedings, acceptance of temporary services and other consultancy related works

v. Conducting examinations for appointment to state services

vi. To advise the State Government regarding disciplinary action taken against an employee

29. Find the mean of the positive factors of 32

A. 10.2   B. 11.2

C. 10.5   D. 11.5

Ans. C

Sol. Number of these factors 1, 2, 4, 8, 16, 32 = 6

Some of these factors = 1 + 2 + 4 + 8 + 16 + 32

= 63

Mean = $\dfrac{sum\ of\ factors}{number\ of\ factors}$

= $\dfrac{63}{6}$

Mean = 10.5

30. Raju and Hemu are friends they were both born in 1995, what is the probability that they have same birthday?

A. 1/365   B. 2/365

C. 1/366   D. 2/366

Ans. A

Sol. The year 1995 is a non-leap year out of two friends say Raju's birthday can be any day of 365 days in a non-leap year also Hamu's birthday can be any day of 365 days of the same year so the total number of outcomes is = 365, we assume all those 365 outcomes are equally likely.

Let E be the event (Raju and Hemu have the same birthday)

Then the number of favorable outcomes to the event

n(E) = 1

P(E) = $\dfrac{n(E)}{n(S)}$

= 1/365

31. If $\frac{x^4+1}{x^2} = 62$, then what is the value of $x^2 - \frac{1}{x^2}$?

    A. $6\sqrt{35}$ B. $16\sqrt{15}$

    C. $36\sqrt{5}$ D. $26\sqrt{45}$

Ans. B

Sol. $\frac{x^4+1}{x^2} = 62$

$x^4 + 1 = 62x^2$

$x^2 + \frac{1}{x^2} = 62$

$\left(x + \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} + 2$

$\left(x + \frac{1}{x}\right)^2 = 62 + 2 = 64$

$\left(x + \frac{1}{x}\right) = \sqrt{64} = 8$

$\left(x - \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} - 2$

$\left(x - \frac{1}{x}\right)^2 = 62 - 2 = 60$

$\left(x - \frac{1}{x}\right) = \sqrt{60} = 2\sqrt{15}$

Now,

$x^2 - \frac{1}{x^2}$

$= \left(x + \frac{1}{x}\right)\left(x - \frac{1}{x}\right)$

$= 8 \times 2\sqrt{15}$

$= 16\sqrt{15}$

32. The incenter of a triangle is determined by

    A. altitudes   B. angle bisectors

    C. medians   D. perpendicular bisectors of the sides

Ans. B

Sol. The incenter of a triangle is intersection point of the angle bisector of a triangle.
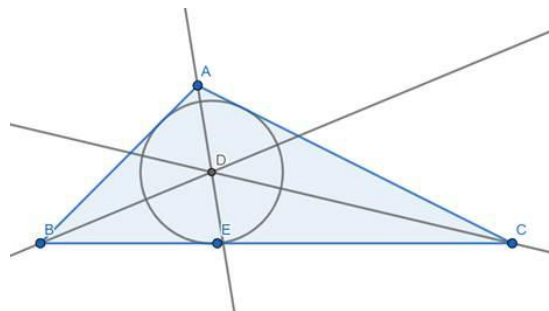
33. 'खूँटी' शब्द का बहुवचन बताइए?

    A. खूँटियाँ   B. खुँटिया

    C. खूटियों   D. खूँटिया

Ans. A

Sol. 'खूँटी' शब्द का बहुवचन खूँटियाँ है

34. उच्च की उत्तरावस्था क्या होगी?

    A. उच्चतम   B. उच्चतर

    C. ऊँचा   D. उच्चम

Ans. B

Sol. मूलावस्था - उत्तरावस्था - उत्तमावस्था

    उच्च - उच्चतर - उच्चतम

35. भूषण की कविता का प्रधान स्वर है-

    A. व्यंग्यात्मक   B. प्रशस्तिपरक

    C. श्रृंगारिक   D. कारुणिक

Ans. B

Sol. भूषण शिवाजी और छत्रसाल के दरबारी कवि थे। भूषण की कविता का प्रधान स्वर प्रशस्तिपरक था।

36. मगरमच्छ का स्त्रीलिंग है?

    A. मगरमच्छी   B. मगरमच्छवी

    C. मादा मगरमच्छ   D. मगरमच्छानी

Ans. C

Sol. 'मगरमच्छ' का स्त्रीलिंग होता है 'मादा मगरमच्छ'| अन्य सभी विकल्प सही नहीं हैं| अतः इस आधार पर सही

    विकल्प मादा मगरमच्छ है|

37. **Choose the sentence with correct usage of pronoun:**

    A. These are nice shoes, but they look uncomfortable.

    B. This are nice shoes, but they look uncomfortable.

    C. It are nice shoes, but they look uncomfortable.

    D. Them are nice shoes, but they look uncomfortable.

Ans. A

Sol. Option A is the sentence which uses the correct form of pronoun.

38. **Choose the most appropriate option to change the narration (direct/indirect) of the given sentence.**

    A. The teacher said, "Be quiet, boys."A. The teacher said that the boys should be quiet.

    B. The teacher called the boys and ordered them to be quiet.

    C. The teacher urged the boys to be quiet.

    D. The teacher commanded the boys that they be quiet.

Ans. C

Sol. Statement A and D are incorrect due to inappropriate usage of connecting verb. In statement B 'called the boys' doesn't make much sense. Hence, statement C is the correct answer.

39. **Identify the best way to improve the underlined part of the given sentence. If there is no improvement required, select 'no Improvement'.**

    A. I ordered **tasty two large** pizzas for the game.A. tasty large two

    B. large tasty two

    C. two tasty large

    D. No improvement

Ans. C

40. **Select the most appropriate option to fill in the blank.**

    The show devoted two or three episodes to each novel, while short stories were _____ in a single episode.

    A. made up   B. concealed

    C. narrated   D. elucidate

Ans. C

Sol. Made up = invented; not true

    Concealed = hidden

    Narrated = give a spoken or written account of

    Elucidate = explain

    The context of the sentence is related to novels and short stories that were aired in a show. With respect to this, 'narrated' is the most suitable word to make the sentence contextually correct.

    Hence, option C is the correct answer.

41. For protection from frost, concrete should be _____

    A. Dense

    B. Free from cracks

    C. Adhesion between mortar and aggregate should be perfect

    D. All the options are correct

Ans. A

Sol. Dense concrete will not permit water to penetrate inside the concrete and as such prevent any hazard from freezing and thawing(frost action).

42. Which one of the following statements is the correct description of the structure of fibre board ?

A. Thin slices of superior quality of wood are glued and pressed on the surface of inferior wood

B. Steamed mass of wood dusts, wood wool and other vegetable fibres are pressed hard to a thickness varying from 3 mm to 12 mm

C. Thin and narrow wood shaving are soaked in a refractory binder material and pressed hard

D. Wood veneer backed by fabric mat

Ans. B

Sol. Fibre boards are steamed mass of wood dusts, wood wool and other vegetable fibres are pressed hard to a thickness varying from 3 mm to 12 mm. They are also known as pressed wood.

43. Addition of pozzolana to ordinary portland cement increase

A. Bleeding   B. Shrinkage

C. Permeability   D. Heat of hydration

Ans. B

Sol.

44. Retarders are used for

A. construction of high rise buildings   B. repair works

C. cold weather condition   D. grouting deep oil wells

Ans. D

Sol. Retarders are used to slow down the initial rate of hydration and extend the initial setting time. It is therefore used to grout deep oil wells, transport RMC (readymade concrete) and avoid cold joints. Accelerator is used for first three options.

45. The total length of a straight bar hooked at both ends is taken as (Here d is the diameter of bar)

A. L + 4d   B. L + 9d

C. L + 12d   D. L + 18d

Ans. D

Sol. Length of one hook is taken equal to 9 times the diameter of bar.

So, the total length of a straight bar hooked at both ends is L + 18d.

46. The top and bottom cover in beams in estimating the quantity of steel work may be taken as

A. 2 to 3 cm   B. 2.5 to 5 cm

C. 6 to 8 cm   D. 8 to 10 cm

Ans. B

Sol. The top and bottom cover in beams in estimating the quantity of steel work may be taken as 2.5 to 5 cm. The side and end cover is assumed to be between 2 to 4 cm.

47. The sphere of diameter 0.02 m is falls in the fluid of kinematic viscosity 10 stokes with the terminal velocity of 0.02 m/s. What is the value of coefficient of drag on the falling sphere?

A. 40

B. 60

C. 80

D. 100

Ans. B

Sol. Drag force is given by $F = C_d \, \rho \, AV^2$

48. If the diameter of the pipe is given as D, what is the maximum thickness of the boundary layer?

A. 0

B. D/2

C. D

D. 2D

Ans. B

Sol. The entirely of the pipe will be the boundary layer, therefore its thickness will be R. As the flow enters the pipe, the boundary layer thickness will increase parabolically starting from zero. The length that it takes for the boundary layer to develop is called the entrance length and the region that consists of a formed boundary layer is called the fully developed region. So maximum boundary layer thickness at r = R = D /2.

49. What is the discharge(m^3/s) from circular pipe having the diameter of 0.5 m and average velocity of flow of 10 m/s?

A. 1.5

B. 1.96

C. 2.76

D. 3

Ans. B

Sol. $Discharge, Q = A \times V$

$A = \dfrac{\pi}{4} \times D^2 = .196 m^2, V = 10 m/s$

Therefore Q=1.96 m^3/s

50. A section line AB appears to be 10.16 cm on a photograph for which the focal length is 16 cm. The corresponding line measures 2.54 cm on a map, which is to a scale 1/50,000. The terrain has an average elevation of 200 m above mean sea level. The flying altitude of the aircraft above mean sea level during photograph will be

A. 1800 m

B. 2000 m

C. 2200 m

D. 2400 m

Ans. C

Sol. $Scale = \dfrac{f}{H - h}$

$\dfrac{10.16 \text{ cm}}{2.54 \times 50000} = \dfrac{16}{H - 20000}$

H = 220000 cm

H = 2200 m

51. Consider the following points related to systematic Error.

i. They arises from the source that act in a similar manner on all observation.

ii. They are compensating in nature.

A. Both (i) and (ii)　　　　　　　　B. only (i)

C. only (ii)　　　　　　　　　　　　D. neither (i) nor (ii)

Ans. B

Sol. Systematic errors are cumulative in nature.

52. A camera of focal length 20 cm is used to photograph a ground of area 1 sqkm. If the photographic plate is of size 20 cm × 20 cm and the height of flight of plane above datum is 1800 m, find out the elevation of the ground in meters.

A. 1200m　　　　　　　　　　　　B. 1000m

C. 800m　　　　　　　　　　　　　D. 600m

Ans. C

Sol. Length of photographic plate = 20 cm

Area photographed = 1 sqkm

Or, Length on ground covered = 1 km = 1000m

Scale of photograph = 1000m to 20 cm = 50 m to 1 cm

Also, Scale = f/H

Or, height of flight above ground = Scale × f = 50 × 20 = 1000m

Given, height of flight of plane above datum = 1800 m

So, elevation of the ground = 1800 – 1000 = 800m

53. A 100 m tape is suspended between the ends under a pull of 200 N. If the weight of the tape is 30 N, the correct distance between the tape ends will be nearly

A. 100.5 m　　　　　　　　　　　B. 100.3 m

C. 100.1 m　　　　　　　　　　　D. 99.9 m

Ans. D

Sol. $$C_{sag} = \frac{-lw^2}{24P^2}$$

$$C_{sag} = -\frac{100 \times 30^2}{24 \times 200^2}$$

C_{sag} = 0.09

Correct distance = 100 – 0.09 = 99.9 m

54. The cost of the machine is Rs. 20, 00, 000, and if it is purchased under instalment basis; the company has to pay 25% of the cost at the time of purchase and the remaining amount in 10 annual equal instalment of Rs. 2, 50, 000 each. If rate of interest is 18%, compounded annually the present worth of the machine will be

A. Rs. 17,01,00　　　　　　　　　B. Rs. 16,22,500

C. Rs. 15,43,00　　　　　　　　　D. Rs. 14,64,500

Ans. B

Sol. Total present value = Payment made at the time of purchase + Present value of instalments

$$= \frac{25}{100} \times 20,00,000 + 2,50,000 \times \frac{1.18^{10} - 1}{1.18^{10} \times 0.18}$$

= 1623521

55. A project requires an investment of 50000/-. Consider risk free rate of return = 8%. Estimated future cash flow of the project is given as follows:

Year	First	Second	Third	Fourth
Future cash flow (Rs.)	12500	15000	20000	17500

What is the Net present value of the project (in Rs.)

A. 2223   B. 3175

C. 3840   D. 4060

E. 4163

Ans. B

Sol.

Year	First	Second	Third	Fourth
Future cash flow (Rs.)	12500	15000	20000	17500
Present value (Rs.)	$\frac{12500}{1.08} = 11574$	$\frac{1500}{(1.08)^2} = 12860$	$\frac{20000}{(1.08)^3} = 15877$	$\frac{17500}{(1.08)^4} = 12863$

So, total present value = 53174

Value of investment = 50,000

Net present value (ENPV) = 53174 – 50,000

= 3174 $\simeq$ 3175

56. If a material has identical elastic properties in all directions, it is said to be:

A. Homogenous   B. Isotropic

C. Elastic   D. Orthotropic

Ans. B

Sol. If a material have identical values of a property in all directions, it is called isotropic.

57. The ratio of maximum shear stress and maximum normal stress at a point in a beam will be

A. 1:2   B. 2:1

C. 1:1   D. 1:3

Ans. C

Sol. In a Mohr's Circle max. shear stress is equal to the maximum normal stress.

58. The ratio of the flexural strengths of two beams of square cross section, the first beam being placed with its top and bottom sides horizontally and second beam being placed with one diagonal horizontally, is:

A. $\sqrt{3}$

B. $\frac{1}{\sqrt{3}}$

C. $\frac{1}{\sqrt{2}}$

D. $\sqrt{2}$

Ans. D

Sol. The flexure strength depends upon the section modulus.

Case 1) first beam being placed with its top and bottom sides horizontally:
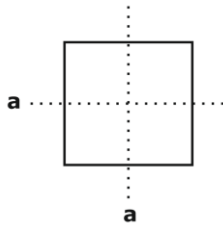
Section Modulus (z) = I/y

$(Z) = \dfrac{a^4}{12*\frac{a}{2}}$

$(Z) = a^3/6$

Case 2) Beam being placed with one diagonal horizontally
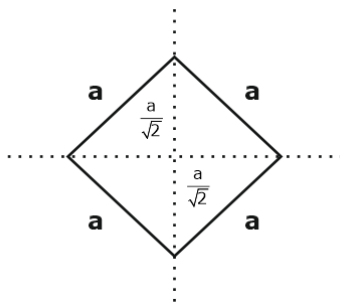
$(Z) = \dfrac{\sqrt{2}a \times (a/\sqrt{2})3}{12*\frac{a}{\sqrt{2}}} \times 2$

$(Z) = \dfrac{a^3}{6 \times \sqrt{2}}$

The ratio of case 1 to case 2 is $= \dfrac{a^3/6}{a^3/6\sqrt{2}} = \dfrac{a^3}{6} \times \dfrac{6\sqrt{2}}{a^3} = \sqrt{2}$

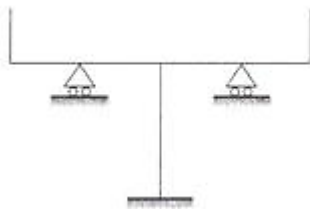59. The fixed support in a real beam becomes in the conjugate beam as:-

A. Roller support

B. Hinged support

C. Fixed support

D. Free support

Ans. D

Sol.

Real Beam	Conjugate Beam
pin	pin
roller	roller
fixed	free
free	fixed
internal pin	hinge
internal roller	hinge
hinge	internal roller

60. What is the degree of static indeterminacy of the frame shown in the figure given below?

A. 4   B. 3

C. 2   D. zero

Ans. C

Sol. $D_s = 3m + r_e - r_r - 3(j)$

M=7; r_e=3+1+1=5: r_r=0; j=8

$\therefore D_s = 3 \times 7 + 5 - 3 \times 8 = 2$

61. What is the percentage of air content in a soil compacted at a moisture content of 18% which has density as 19.65 kN/m^3. Assume G = 2.7

A. 22%   B. 18.8%

C. 20%   D. 17.63%

Ans. D

Sol.

$$\gamma_b = \frac{G\gamma_w(1+w)}{1+e}$$

$$19.65 = \frac{2.7 \times 9.81 \times 1.18}{1+e}$$

$$e = 0.59$$

$$Se = wG$$

S= 0.18 x 2.7/0.59

S=8237

a_c = 1-S = 1-0.8237 = 0.1763 = 17.63%

62. The clay deposit of thickness 10 cm and void ratio 0.5 undergoes settlement and now it's final void ratio is 0.2. The thickness (cm) of the settled layer is _____.

    A. 7   B. 1.5

    C. 2   D. 8

Ans. D

Sol. $\Delta h = \frac{\Delta e}{1+e} * H$

$\Delta h = ((0.5-0.2)*10)/(1+0.5) = 2$

Thickness of settled layer = H - Δh = 10 - 2 = 8 cm

63. The sieve analysis result of a soil sample are given as:

Percentage passing 75 μ sieve = 6

Percentage retained on 4.75 mm sieve = 50

Coefficient of curvature = 1.2

D_{30} = 2mm

D_{10} = 0.6mm

According to ISC system, soil can be classified as

    A. GW   B. SW

    C. GP   D. SP

Ans. A

Sol. Percentage passing through 4.75 mm = 100 – 50 = 50 %

Percentage retained on 75 μ sieve = 50 – 6 = 44 %

So, soil is Gravel.

$$Now, C_C = 1.2 = \frac{(D_{30})^2}{D_{60} X D_{10}}$$

$$1.2 = \frac{(2)^2}{0.6 X D_{60}}$$

$$D_{60} = \frac{4}{0.6 X 1.2} = 5.56$$

$$Now, C_u = \frac{D_{60}}{D_{10}} = \frac{5.56}{0.6} = 9.27$$

$$As \, C_u > 4 \, and \, 1 < C_C < 3$$

So, soil is well graded. (GW)

64. For a soil sample, percentage air void is 20% and water content is 40% take specific gravity of solids as 2.7. What will be the dry unit weight for this soil sample?

    A. 1.04 g/cc   B. 1.06 g/cc

    C. 19.83 kN/m^3 D. 20.08 kN/m^3

Ans. A

Sol. As we know

$$\gamma_d = \frac{(1-n_a).G.\gamma_w}{1+w.G} = \frac{0.8 \times 2.7 \times 1}{1+0.4 \times 2.7} = 1.04$$

65. A reinforced cantilever beam of span 4 m has a cross section of 150x500 mm. If checked for lateral stability and deflection, the beam will _____.

    A. Fail in deflection only

    B. Fail in lateral stability only

    C. Fail in both deflection and lateral stability

    D. Satisfy the requirements of deflection and lateral stability

Ans. C

Sol. Lateral stability-

   For cantilever beam, span≤25b (it should be satisfied)

   4m≤25×0.150m

   =3.75

   4>3.75

   so, it will fail.

   For the control of vertical deflection-

   For cantilever beam $(l/d)_{basic} \leq 7$

   Here, $(l/d)_{provided} = 4000/500 = 8$

   should be less than $(l/d)_{max}$.

   So, it will also fail.(not satisfying the condition)

66. The floor slab of a building is supported on reinforced cement floor beams. The ratio of the end and intermediate spans is kept at _____.

    A. 0.7   B. 0.8

    C. 0.9   D. 0.6

Ans. C

Sol. The floor slab of a building is supported on reinforced cement floor beams. The ratio of the end and intermediate spans is kept at 0.9

67. Partial safety for concrete and steel are 1.5 and 1.15 respectively, because _____.

    A. Concrete is heterogeneous while steel is homogeneous

    B. The control on the quality of concrete is not as good as that of steel

    C. Concrete is weak in tension

    D. Voids in concrete are 0.5% while those in steel are 0.15%

Ans. B

Sol. Partial safety for concrete and steel are 1.5 and 1.15 respectively, because control on the quality of concrete is not as good as that of steel.

68. Which one of the following statements is correct?

A. Shear cracks start due to high diagonal tension in case of beams with their webs and high pre-stressing force.

B. Shear design for a pre-stressed concrete beam is based on elastic theory

C. In the zone where bending moment is dominant and shear is insignificant, cracks occur at 20° to 30°.

D. After diagonal cracking, the mechanics of shear transfer in a pre-stressed concrete member is very much different from that in reinforced concrete members.

Ans. B

Sol. Shear cracks is not due to high pre-stressing force, Shear design for a pre-stressed concrete beam is based on elastic theory.

69. For the plate of 16 mm thickness, diameter of rivets used should be

A. 20 mm 　　　　　　　　　　　　B. 16 mm

C. 24 mm 　　　　　　　　　　　　D. 18 mm

Ans. C

Sol. By Unwin's formula dia of bolt = $6.05\sqrt{t_{mm}}$

$= 6.05 \times \sqrt{16}$

$= 6.05 \times 4 = 24.20$ mm

70. When compression is transferred from a wide flange to narrow web, localized bearing stresses forms. The failure caused by these localized bearing stresses is called _____.

A. Web crippling 　　　　　　　　B. Web shear flow

C. Web bearing 　　　　　　　　　D. Web buckling

Ans. A

Sol. Web crippling is a common mode of failure experienced by web elements of thin-walled beams. Web crippling is caused by high localized stress concentrations, which in turn are caused by concentrated loads or reactions applied on a short length of beam.
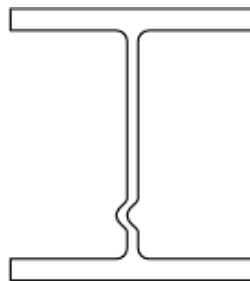
71. As per IS 800:2007, the maximum edge distance required for a 12mm thick steel plate member connected to another 16 mm thick plate by rivet connection is_____ mm.

A. 40 　　　　　　　　　　　　　　B. 88

C. 100 　　　　　　　　　　　　　　D. 120

Ans. B

Sol. As per IS 800:2007

Thickness of thinner member, t = 12 mm

Maximum edge distance = 40 mm + 4t =40 + 4 x 12 =88 mm

72. In ordinary residential buildings, DP.C. may be provided:

A. At ground level

B. Between ground level and water table level

C. At water table level

D. At plinth level

Ans. D

Sol. D.P.C is short form of damp proof course. It is always provided at plinth level.

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