



KD Campus Pvt. Ltd

2007, OUTRAM LINES, 1ST FLOOR, OPPOSITE MUKHERJEE NAGAR POLICE STATION, DELHI-110009

Answer-key & Solution

SSC JE (Civil)
MOCK -(137)
Date : 21.4.2018

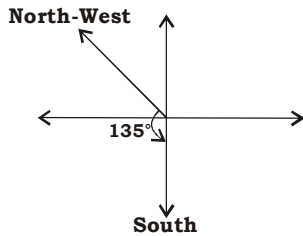
1. B	26 D	51 B	76 C	101. C	126. D	151. A	176. B
2. B	27 C	52 A	77 B	102. C	127. D	152. C	177. C
3. B	28 B	53 A	78 C	103. A	128. D	153. C	178. B
4. B	29 D	54 D	79 A	104. C	129. B	154. B	179. D
5. D	30 A	55 A	80 A	105. C	130. D	155. C	180. D
6. B	31 D	56 D	81 B	106. C	131. A	156. D	181. B
7. B	32 D	57 A	82 B	107. A	132. D	157. D	182. C
8. D	33 C	58 D	83 C	108. A	133. A	158. B	183. C
9. *	34 C	59 D	84 C	109. D	134. B	159. B	184. B
10. A	35 C	60 B	85 B	110. D	135. C	160. D	185. A
11. D	36 A	61 D	86 C	111. C	136. C	161. A	186. D
12. D	37 D	62 C	87 A	112. C	137. C	162. D	187. C
13. A	38 C	63 C	88 D	113. C	138. B	163. B	188. C
14. *	39 B	64 B	89 A	114. D	139. A	164. A	189. C
15. B	40 B	65 D	90 B	115. A	140. C	165. B	190. C
16. C	41 D	66 C	91 A	116. A	141. C	166. D	191. B
17. B	42 B	67 D	92 A	117. D	142. D	167. D	192. D
18. B	43 C	68 D	93 C	118. D	143. B	168. D	193. D
19. D	44 A	69 B	94 B	119. D	144. D	169. A	194. B
20. B	45 C	70 B	95 A	120. B	145. B	170. C	195. B
21. A	46 D	71 C	96 B	121. C	146. C	171. C	196. C
22. B	47 C	72 D	97 D	122. D	147. D	172. B	197. D
23. C	48 C	73 A	98 A	123. A	148. B	173. D	198. B
24. A	49 C	74 C	99 B	124. D	149. C	174. B	199. B
25. C	50 D	75 A	100 C	125. C	150. A	175. C	200. B

Note : If your opinion differ regarding any answer, please message the mock test and Question number to 9821756838

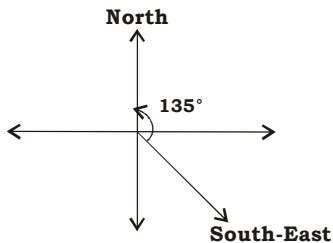
Note : If you face any problem regarding result or marks scored, please contact : 9313111777

SOLUTION SSC JE (Civil) MOCK TEST no. 137

1. (B) As,



Similarly,



2. (B) As, $\begin{matrix} \underline{A} \underline{G} \underline{L} \underline{P} & \underline{S} \underline{Y} \underline{D} \underline{H} \\ & \uparrow \\ & +18 \end{matrix}$

Similarly,

$\begin{matrix} \underline{L} \underline{R} \underline{W} \underline{A} & \underline{D} \underline{J} \underline{O} \underline{S} \\ & \uparrow \\ & +18 \end{matrix}$

3. (B) Professor works in college. Similarly, **Doc-tor** works in Hospital.

4. (B) As, $841 = (25 + 4)^2$
Similarly, **1521** = $(35 + 4)^2$

5. (D) Crane, Parrot and Cuckoos are birds while **Cow** is an animal.

6. (B) $\begin{matrix} \underline{A} & \underline{D} & \underline{N} & \underline{I} & & \underline{C} & \underline{G} & \underline{O} & \underline{L} \\ \uparrow & \uparrow & \uparrow & \uparrow & & \uparrow & \uparrow & \uparrow & \uparrow \\ +3 & +10 & -5 & & & +4 & +10 & -5 & \end{matrix}$

$\begin{matrix} \underline{G} & \underline{J} & \underline{T} & \underline{O} & & \underline{O} & \underline{R} & \underline{B} & \underline{W} \\ \uparrow & \uparrow & \uparrow & \uparrow & & \uparrow & \uparrow & \uparrow & \uparrow \\ +3 & +10 & -5 & & & +3 & +10 & -5 & \end{matrix}$

7. (B) 72, 84 and 108 are multiple of 12 while **78** is multiple of 13.

8. (B) KP, IR and XC are opposite letters to each other in alphabet while **GS** are not opposite letter to each other

9. (*) Banefic → Benefic → Benefica → Beneficial.

10. (A) $\frac{(15 \times 3) + 45 - 25}{(10 \div 2) \div 2 + 8 - 33}$

After changing the sign as per the given details,

$\Rightarrow \frac{(15 \div 3) \times 45 + 25}{(10 - 2) - 2 \times 8 + 33} = 10$

11. (D) As, $106 = 9^2 + 5^2$, $56 = 9^2 - 5^2$
 $272 = 16^2 + 4^2$, $240 = 16^2 - 4^2$

Similarly,

841 = $20^2 + 21^2$, $41 = 21^2 - 20^2$

12. (D) $604 = 9^3 - 5^3$, $45 = 9 \times 5$
 $504 = 8^3 - 2^3$, $16 = 8 \times 2$

6734 = $19^3 - 5^3$, $95 = 19 \times 5$

13. (A) As, $13 - 6 = 7 \Rightarrow 7 \times 6 = 42$

$17 - 8 = 9 \Rightarrow 9 \times 6 = 54$

Similarly,

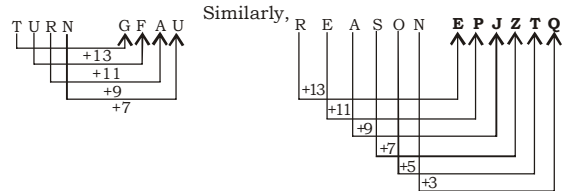
$27 - 9 = 18 \Rightarrow 18 \times 6 = 108$

14. (*) Yellow → Green

Red → Blue

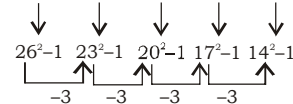
Pink → Violet

15. (B) As,



16. (C) **MASTER**

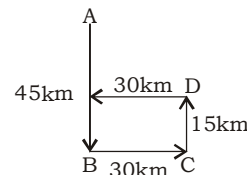
17. (B) 675 528 399 288 **195**



18. (B) $\begin{matrix} \underline{45} & \underline{67} & \underline{111} & \underline{199} & \underline{375} \\ \uparrow & \uparrow & \uparrow & \uparrow & \uparrow \\ \times 2-23 & \times 2-23 & \times 2-23 & \times 2-23 & \times 2-23 \end{matrix}$

19. (D) Tree → Branch → Leaves → Flower → Fruit

20. (B)



21. (A) Number of days between 10 January, 2016 and 15 September, 2016

= 21+29+31+30+31+30+31+31+15 = 249

then, day on 15th September, 2016 = $\frac{249}{7}$

= $35 \frac{4}{7}$

= 35 weeks + 4 days = 4 days = **Thursday**



I False

II False

23. (C)



26. (D) As, KILOGRAM has 8 letters and $8^3 = 512$.
Similarly, KILOMETER has 9 letters and $9^3 = 729$

27. (C) As,

$$\begin{array}{cccccc} S & I & S & T & E & R \\ \text{opp.} \downarrow & \swarrow & \text{opp.} \downarrow & \swarrow & \swarrow & \swarrow \\ H & S & I & G & R & E \end{array}$$
 Similarly,

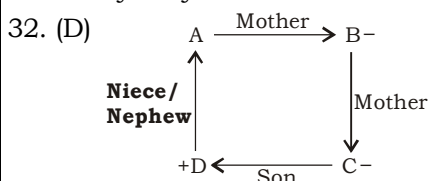
$$\begin{array}{cccccc} M & O & T & H & E & R \\ \text{opp.} \downarrow & \swarrow & \text{opp.} \downarrow & \swarrow & \swarrow & \swarrow \\ N & T & O & S & R & E \end{array}$$

28. (B) As, Histology deals with the study of Tissues. Similarly, Ecology deals with the study of **Environment**

29. (D) Except **UOFA**, the remaining have vowels only.

30. (A) Except **Ostrich**, the remaining can fly.

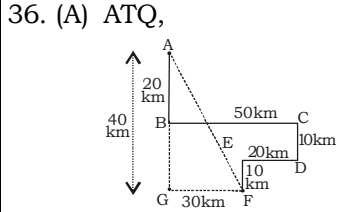
31. (D) Except **Subtraction**, the remaining are synonyms.



33. (C) $20 = 9 \times 5 - 5^2$
 $20 = 8 \times 7 - 6^2$
 $17 = 9 \times 9 - 8^2$
 $47 = 8 \times 9 - 5^2$

34. (C) $55 = 8 \times 9 - (9+8)$
 $29 = 6 \times 7 - (6+7)$
 $20 = 8 \times 4 - (8+4)$

35. (C) $72 = 9 \times 8$
 $45 = 5 \times 9$
 $30 = 6 \times 5$
 $48 = 8 \times 6$



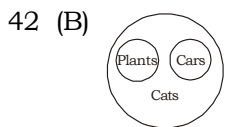
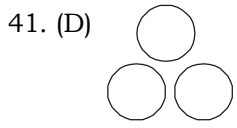
$AG = AB + CD + EF = 40$ km
 $GF = BC - ED = 50 - 20 = 30$ km
 Points AGF form a right angle triangle
 So, $AF = 50$ km

37. (D) From fig (i) and (iii)
 $\frac{3}{5} \quad 2 \quad 1$

38. (C) $1 \quad 9 \quad 36 \quad 100 \quad 225$
 $\uparrow \quad \uparrow \quad \uparrow \quad \uparrow \quad \uparrow$
 $+2^3 \quad +3^3 \quad +4^3 \quad +5^3$

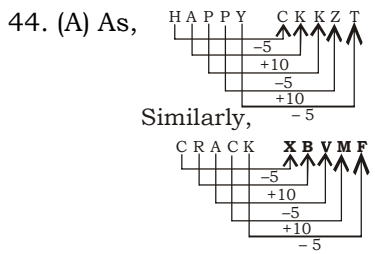
39. (B) $1 \quad 4 \quad 27 \quad 256 \quad 3125$
 $\downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow$
 $1^1 \quad 2^2 \quad 3^3 \quad 4^4 \quad 5^5$

40. (B) $x + x + 4 + \dots + x + 20 = 78$
 $\Rightarrow 6x + 4(1 + 2 + 3 + 4 + 5) = 78$
 $\Rightarrow 6x = 78 - 60 = 18$
 $\Rightarrow x = 3$ years

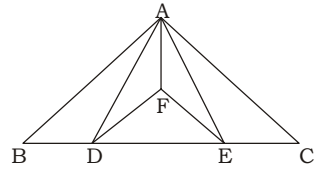


I. **False**
 II. **False**

43. (C)
 Letter \rightarrow Word \rightarrow Sentence \rightarrow Paragraph
4 **1** **3** **2**



45. (C) abab**cabcd**abcde
 46. (D) $25 \div 5 - 10 \times 2 + 30 = 15$
 47. (C)



$\triangle ABC, \triangle ADB, \triangle DEF, \triangle ADF, \triangle AFE, \triangle ACE,$
 $\triangle ADE, \triangle ADC, \triangle ABE$

49. (C) Obedience \rightarrow Obedience \rightarrow Obediencia \rightarrow Obedient

51. (B) The Mudumalai National Park (MNP) is located about 150 kilometres north-west of Coimbatore city in Tamil Nadu. The protected area is home to several endangered and vulnerable species including Indian elephant, Bengal tiger, gaur and Indian leopard. There are at least 266 species of birds in the sanctuary, including critically endangered Indian white-rumped vulture and long-billed vulture.

52. (A) Justice Mukul Mudgal, the Retired judge of Delhi High Court, has been elected as the new Chairman of FIFA Governance committee at the world football governing body's 67th Congress in Manama. The position of the governance chief fell vacant after Miguel Maduro was fired for his role in

blocking Russian World Cup official Vitaly Mutko from retaining his seat on ruling council. Prior to this appointment, Justice Mudgal was the deputy chairman of the governance committee.

53. (A) The interim government of India, formed on 2 September 1946 from the newly elected Constituent Assembly of India, had the task of assisting the transition of India and Pakistan from British rule to independence. Initially, headed by the Viceroy of India, it was changed to a council of ministers. Jawaharlal Nehru was the Vice President of the council and he held powers of a Prime Minister. Some important members of interim government:

- Viceroy and Governor-General of India: The Viscount Wavell (Britain)
- Vice President of the Executive Council: Jawaharlal Nehru (INC)
- Home Affairs, Information and Broadcasting: Vallabhbhai Patel (INC)
- Defence: Baldev Singh (INC)
- Finance: Liat Ali Khan (All-India Muslim league)

54. (D) Per capita GDP can also be used to measure the productivity of a country's workforce, as it measures the total output of goods and services per each member of the workforce in a given nation. However, many economists state that a better measure of worker productivity may be GDP per hour worked. Per capita income, also known as income per person, is the mean income of the people in an economic unit such as a country or city.

55. (A) The 2017 hunting festival 'Bishu Parv (or Sendra)' of the tribal community has recently observed in a 'bloodless and symbolic' manner without harming the wildlife in the Dalma Wildlife Sanctuary in Jharkhand. The forest department has set up check posts at all entry points to prevent hunters from entering the sanctuary with arms to kill the animals. The wildlife sanctuary has elephants, barking deer, sloth bear and porcupines as the main inhabitants.

56. (D) India's first bio-refinery plant has been inaugurated by the Union Minister for Road Transport and Highway Nitin Gadkari at Rahu in Pune district, Maharashtra. The plant will produce ethanol from variety of biomass. The bio refinery plant is capable of producing one million litre of ethanol per annum by

processing a variety of agro-residue like rice and wheat straw, cotton stalk, cane trash, corn cobs with superior product yields. Biofuel is cost effective and pollution free.

57. (A) Endocrinologists have special training in the treatment of diabetes, although their expertise is not limited to diabetes, but to the entire endocrine system. An endocrinologist specializes in hormone secretion and regulation, tissue function and hormone-controlled metabolic events such as sleep and stress.

58. (D) Sulphur is a versatile element and is used in the pharmaceutical, medical, and industrial industries to make fertilizers, create batteries and produce goods like rubbers and insecticides. Sulphur is pale yellow in color; it is also odourless and brittle in its solid form. Sulphur comes in three allotropic forms: orthorhombic, monoclinic and amorphous, and depending on its form, it varies in physical properties and suitability for various purposes.

59. (D) Energy is the capacity of a physical system to do work. The common symbol for energy is E. The standard unit is the joule, symbolized by J.

Some important Units of energy :-

- Orders of magnitude (energy)
- Barrel of oil equivalent Calorie
- Electronvolt
- Gasoline gallon equivalent
- Joule
- Kilowatt hour

60. (B) Rate of evaporation is very high in these regions the water gets evaporated thus increasing the salt concentration in the remaining water. Crustaceans help in decreasing Salinity.

61. (D)

- During the Non-Cooperation movement government did not show its negotiable attitude.
- public meeting were banned.
- press had been restricted and many leaders were arrested along with Gandhi.

62. (C) Example of mixed farming production of wheat along with cattle rearing in same farm.

63. (C) In this case, the President neither rejects nor returns the bill, but simply keeps the bill pending for an indefinite period. This is the power of the President not to take any action (either positive or negative). The bill

is known as the pocket veto. The President can exercise this veto power as the Constitution does not prescribe any time-limit within which he has to take the decision with respect to a bill presented to him for his assent. In USA, on the other hand, the President has to return the bill for reconsideration within 10 days.

In 1986, President Zail Singh exercised the pocket veto with respect to Indian Post office (Amendment) Bill.

65. (D) The economic survey is compiled by Department of economic of affairs. Ministry of Finance office of economic advisor publishes Wholesale Price Index (WPI), while Central Statistic Organization (CSO) publishes IIP and CPI.
67. (D) Indirect taxes are the main source of India's tax system. The most important commodities from the revenue point of view are sugar, cotton, mill cloth, tobacco, motor spirit, matches and cement.
68. (D) Harpreet Singh from India has won the bronze medal in Greco-Roman 80kg category at 2017 Asian Wrestling Championships. He edged out Na Junjie of China by 3-2 in the play-off for the bronze medal.
69. (B) Tanjore paintings are panel paintings (done on solid wood planks) and hence were also referred to as 'palagaipadam' in local parlance. Tanjore paintings are known for their surface richness. The themes of most of these paintings are Hindu gods and goddesses and as well as saints.
70. (B) Igneous rocks are created from the cooling of molten magma/lava and begin the rock cycle. They are called primary rocks.
72. (D) Milk contains small amount of Vitamin-C. Vitamin-C is present in yellow bell paper. Milk is a good source of Calcium, Maganesium, Phosphors, Potassium, Selenium, Protein and Carboydrate.
73. (A) Avogadro's law - Equal volumes of all gases under same temperature and pressure contain equal number of molecules.
74. (C) Assistance provided by the center to five year plan. The Government's support to the Central plan is called the Gross Budgetary support. In the recent year the GBS has been slightly more than 50% of the total central plan. The share of the GBS in central plan has been rising since 2008-09.
75. (A) Although the Mughal Emperor Shah Jahan first ordered the building of the Taj Mahal in 1632, it took 20 years or so to build it. Ustad

Ahmad Lahouri was likely the architect that oversaw the majority of the work. It took at least 20,000 people to create the massive structure, along with a large number of elephants. Construction of the Taj Mahal cost more than 32 crore rupees, according to Tajmahal.org.uk, which in today's currency is more than \$200 million dollars for the building and its surroundings.

76. (C) •Paddy is a tropical crop and grown where the average temperature during the growing season is between 22°C and 27°C. Abundant sunshine is essential during its four months of growth. The minimum temperature should not go below 15°C as germination cannot take place below that temperature.
- The temperature required for wheat during growing season is around 15.5°C. The weather should be warm and moist during the early stage of growth and sunny and dry in the later stages. The average temperature of the hottest month should not exceed 20°C. A frost-free period of 100 days is usually required but some fast-ripening varieties may mature only in 90 days.
 - Maize is grown in temperatures between 26°C and 27°C during the day and around 14°C during the night. But the most important factor is the 140 frost-free days. The crop is very susceptible to frost; therefore, its cultivation in temperate latitudes is limited.
 - Groundnuts grow well in warm areas, below 1500m above sea level. The best temperature requirement is about 30° C. They do not grow below 15° C.
77. (B) The 43rd edition of G7 summit will be held at Taorminain Sicily, Italy. The attendees will include the leaders of the seven G7 member states as well as representatives of the European Union. The 43rd G7 summit will be the first summit for British Prime Minister Theresa May, French President Emmanuel Macron, Italian Prime Minister Paolo Gentiloni and U.S. President Donald Trump.
78. (C) The Kesavananda Bharathi judgment or His Holiness Kesavananda Bharati Sripadagalvru v/s State of Kerala is a landmark decision of

- the Supreme Court of India that outlined the Basic Structure doctrine of the Constitution.
79. (A) The Committee on Investor Awareness and Protection, chaired by Mr D. Swaroop from Pensions Fund Regulatory Authority of India (PFRDA), on the need for minimum standards for financial advisers and financial education. The paper states that the twin goals of regulation and making the populace financially able are essential for the healthy growth of the financial service industry.
80. (A) Vinay Mohan Kwatra, A 1988-batch Foreign Service officer, has been appointed as the next ambassador to France. Kwatra will succeed Mohan Kumar, who is retiring. Currently, he is a joint secretary in the Prime Minister's Office (PMO). He has also held the position of joint secretary in-charge of the counter-terrorism division in the MEA.
81. (B) Naujawan Bharat Sabha was a left-wing Indian association that sought to foment revolution against the British Raj by gathering together worker and peasant youths. It was founded by Bhagat Singh in March 1926 and was a more public face of the Hindustan Republican Association.
83. (C) Hygrometers is instruments used for measuring humidity. A simple form of a hygrometer is specifically known as a "psychomotor" and consists of two thermometers, one of which includes a dry bulb and the other of which includes a bulb that is kept wet to measure wet-bulb temperature.
86. (C) Muller's work contributed to the developing interest in Aryan culture, which often set Indo-European ('Aryan') traditions in opposition to Semitic religions. For Müller the discovery of common Indian and European ancestry was a powerful argument against racism, arguing that "an ethnologist who speaks of Aryan race, Aryan blood, Aryan eyes and hair, is as great a sinner as a linguist who speaks of a dolichocephalic dictionary or a brachycephalic grammar" and that "the blackest Hindus represent an earlier stage of Aryan speech and thought than the fairest Scandinavians".
87. (A) • The Nile is a major north-flowing river in north-eastern Africa. It is generally regarded as the longest river in the world. Egyptian civilization and Sudanese Kingdoms have depended on the river since ancient times. Most of the population and cities of Egypt lie along those parts of the Nile valley north of Aswan, and nearly all the cultural and historical sites of Ancient Egypt are found along river banks.
- Java is an island of Indonesia. With a population of over 141 million (the island itself) or 145 million (the administrative region) as of 2015 Census released in December 2015, Java is home to 56.7 percent of the Indonesian population and is the most populous island on Earth. The Indonesian capital city, Jakarta, is located on western Java.
88. (D) Article 75(3) of the Indian Constitution makes the council of ministers collectively responsible to the house of people or the Lok Sabha. This means that if the Ministry loses the confidence of the "Lok Sabha", all ministers including those who are from Rajya Sabha have to go. The entire ministry is obliged to resign. This means that ministers fall and stand together. This is called "Rule of Collective Responsibility".
89. (A) • In plants, photosynthesis takes place in Chloroplasts, which contain the Chlorophyll. Chloroplasts are surrounded by double membrane and contain a third inner membrane, called the Thylakoid membrane.
- Mitochondria are known as the power houses of the cell. They are organelles that act like a digestive system which takes in nutrients, breaks them down, and creates energy rich molecules for the cell. The biochemical processes of the cell are known as cellular respiration.
 - Messenger RNA (mRNA) molecules carry the coding sequences for protein synthesis and are called transcripts; ribosomal RNA (rRNA) molecules form the core of a cell's ribosomes and transfer RNA (tRNA) molecules carry amino acids to the ribosomes during protein synthesis.
90. (B) In India, at present, there are 6 Zonal Council. Originally five councils were created as per the States Reorganization Act 1956 as follows: Northern Zonal Council, Central Zonal Council, Eastern Zonal Council, Southern Zonal Council, and Western Zonal Council. The North East Council was set up in 1971.
92. (A) National Programme of Nutritional Support to Primary Education, popularly known as the Mid-Day Meal Scheme (MDM) was started in 1995. The Midday Meal Scheme is covered by the National Food Security Act, 2013.
93. (C) Karan Singh (59), the Ayurveda and Co-Operative Minister of Himachal Pradesh, has recently passed away at All India Institute of

Medical Sciences (AIIMS) in Delhi. He was elected from Banjar assembly constituency in Kullu district in the last assembly elections in 2012.

95. (A)

Rank	Country	Uranium Reserves (metric tons)
1.	Australia	1,706,100
2.	Kazakhstan	679,300
3.	Russian Fed	505,900
4.	Canada	493,900

96. (B) In chemistry, the term transition metal (or transition element) has three possible meanings;

- The IUPAC definition defines a transition metal as “an element whose atom has a partially filled d sub-shell, or which can give rise to cations with an incomplete d sub-shell”
- Many scientist describe a “transition metal” as any element in the d-block of the periodic table, which includes groups 3 to 12 on the periodic table. In actual practice, the f-block lanthanide and actinide series are also considered transition metals and are called “inner transition metals”.
- Cotton and Wilkinson expand the brief IUPAC definition by specifying which elements are included. As well as the elements of groups 4 to 11, they add scandium and yttrium in group 3 which have a partially filled d sub shell in the metallic state. These last two elements are included even though they do not (so far) seem to possess the catalytic properties which are so characteristic of the transition metals in general. Lanthanum and actinium in Group 3 are however classified as lanthanides respectively.

97. (D) The hepatic portal vein is a blood vessel that carries blood from the gastrointestinal tract and spleen to the liver. This blood is rich in nutrients that have been extracted from food.

98. (A) Calcium is a mineral that helps you build and maintain strong bones and teeth. Good calcium intake throughout your life can help to prevent osteoporosis. When you have osteoporosis your bones are weak and thin from loss of calcium. Weak bones can break more easily than strong bones. Calcium is also used in other parts of your body. It helps your muscles work and your heart beat.

Skimmed milk, ragi, Egg and fish such as sardines and canned salmon are great sources of calcium.

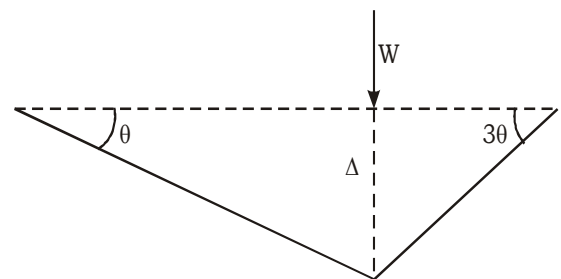
99. (B) In India, the Ombudsman is known as the Lokpal or Lokayukta. An Administrative Reforms Commission (ARC) was set up on 5 January 1966 under the Chairmanship of Shri Morarji Desai. It recommended two tier machinery : Lokpoal at the Centre (Parliamentary commissioner, as in New Zealand) and one Lokayukta each at the State level.

100.(C) Megasthenes was an ancient Greek historian, diplomat and Indian ethnography and explorer in the Hellenistic period, author of the work Indicia. He was born in Asia Minor and became an ambassador of Seleucus Nicator of the Seleucid dynasty possibly to Chandragupta Maurya in Pataliputra, India.

102.(C)The riverts are assumed to resist the load equally in the elastic theory. But in reality, the outer rivets carry more load than the ones in the middel rows.

It start yielding earlier and there will be redistribution of load among riverts. And the failure will occur when all rivets have yielded and strength of the group of riverts is equal to the streangth of one rivet multiplied by the number of riverts.

104(C).Taking hinges at both fixed ends and under the load



$$\left\langle \begin{array}{c} \longleftarrow 3L/4 \longrightarrow \longleftarrow L/4 \longrightarrow \end{array} \right\rangle$$

$$W \cdot \Delta M_p \theta + 2M_p (4\theta) + 2M_p (3\theta)$$

$$\therefore \Delta = \frac{3L}{4} \theta$$

$$\frac{3LW}{4} = 15M_p$$

$$W = \frac{20M_p}{L}$$

106 (C). $M_p = Z_p \times f_y$

$$\therefore f_y = \frac{120 \times 10^3}{5 \times 10^{-4}}$$

$$= 24 \times 10^7 \text{ N/m}^2$$

$$= 240 \text{ N/mm}^2$$

112(C). $i_c = (G-1)(1-n) = (2.7-1) \left(1 - \frac{1}{3}\right) = 1$

114(D). If V is the volume of wet soil mass, then

Volume of air, $V_a = \frac{V}{6}$

Volume of water, $V_w = \frac{V}{3}$

But void ratio is given by

$$e = \frac{V_v}{V_s}$$

where V_v is the volume of voids = $V_a + V_w$

$$= \frac{V}{6} + \frac{V}{3} = \frac{V}{2}$$

$$V_s = V - V_v = V - \frac{V}{2} = \frac{V}{2}$$

$$e = \frac{V/2}{V/2} = 1$$

115(A). Shrinkage limit, $w_s = \frac{e}{G} \times 100$

$$\therefore e = 0.1 \times 2.7 = 0.27$$

Porosity, $n = \frac{e}{1+e} \times 100 = \frac{0.27}{1+0.27} \times 100$
= 21.2%

119(D). Undrained triaxial test, the clay remains unconsolidated and no volume changes take place.

$$\frac{\sigma_3}{E} - \mu \frac{\sigma_1}{E} - \mu \frac{\sigma_2}{E} = 0 \quad [\sigma_2 = \sigma_3]$$

$$\mu \frac{\sigma_3}{\sigma_1 + \sigma_3}$$

121(C). $Re = 2000$ for critical flow
Viscosity, $\nu = 0.01$ stokes

$$Re = \frac{VD}{\nu} = 2000$$

Velocity of flow, $V = \frac{2000 \times 0.01}{1} = 20 \text{ cm/s}$

Flow at critical Reynolds number,

$$Q = V \times \frac{\pi D^2}{4} = 20 \times \frac{\pi D^2}{4} \times 1 = 15.7 \text{ cm}^3/\text{s}$$

$$= 0.01571/\text{s}$$

122(D). $y_c^3 = \frac{q^2}{g}$

$$1.23 = \frac{q^2}{9.81} \Rightarrow q = 4.12 \text{ m}^2/\text{s}$$

Therefore discharge $Q = q \times B = 4.12 \times 3 = 12.35 \text{ m}^3/\text{s}$

124(D). Power developed in kW = $10,000 \times 0.756 = 7560 \text{ kW}$

$$\text{Specific speed} = \frac{N\sqrt{P}}{H^{5/4}} = \frac{500 \times \sqrt{7560}}{(81)^{5/4}} = 179$$

in SI units

Turbine	Specific speed (SI units)
Pelton	10-60
Francis	60-300
Kaplan and Propeller	>300

128(D). $R = 1 - \left(1 - \frac{1}{T}\right)^n = 1 - \left(1 - \frac{1}{100}\right)^2 = 0.0199$
= 1.99%

129(B). The mean annual runoff is $1 \text{ m}^3/\text{s}$.

Total annual rainfall will be $1 \times 365 \times 24 \times 60 \times 60 \text{ m}^3 = 31,536,000 \text{ m}^3$.

Catchment area = 31.54 km^2

Therefore, the effective rainfall is

$$\frac{31,536,000}{31.54 \times 10^6} = 1 \text{ m} = 100 \text{ cm}$$

132(D). $(100 - w_1) V_1 = (100 - w_2) V_2$

$$\frac{V_2}{V_1} = \left(\frac{100 - w_1}{100 - w_2}\right) = \frac{100 - 98}{100 - 96} = \frac{2}{4} = 0.5$$

Therefore, Decrease in volume is 50%

133(A). $BOD = [\text{Initial DO} - \text{Final DO}] \times \text{Dilution factors}$ where Dilution factor

$$= \frac{\text{Volume of diluted sample}}{\text{Volume of undiluted Sample}}$$

$$BOD = (8-2) \times \frac{100}{1} = 600 \text{ mg/l}$$

139(A). $SSD = 0.278 Vt + \frac{V^2}{254f}$

$$= 0.278 \times 80 \times 2.5 + \frac{80^2}{254 \times 0.35} = 127.6 \text{ m}$$

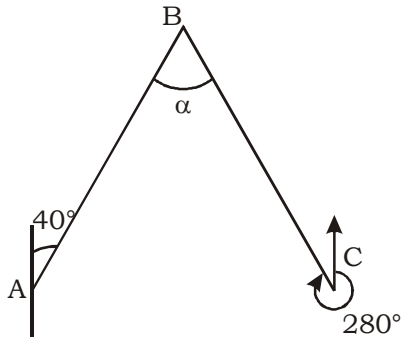
141(C). $G = 2C$

$$C = \frac{G}{2} = \frac{48}{2} = 24$$

148(B). $BB \text{ of BC} = FB \text{ of BC} + 180^\circ$

$$FB \text{ of BC} = 280^\circ - 180^\circ$$

$= 100^\circ$



BB of AB = FB of AB + 180°

= 40° + 180° = 220°

Included, $\alpha = \text{BB of AB} - \text{FB of BC}$

= 220° - 100° = 120°

150(A). True bearing = Magnetic bearing \pm Declination

True bearing = 289° 10' + 2° = 291° 10'

Therefore, the present magnetic bearing will be

= 291° 10' + 5°

= 296° 10'

159(B). Shear stress due to torsion, $f_s = \frac{T}{J} R = \frac{16T}{\pi d^3}$

Bending stress, $f_b = \frac{M}{I} R = \frac{32M}{\pi d^3}$

$f_s = f_b \Rightarrow \frac{M}{T} = \frac{1}{2}$

161(A). Taking moment about B

$R_A = \frac{50 \times 4 - 120}{8} = 10 \text{ kN}$

163(B). The magnitude of maximum shear stress,

$t_{\max} = \frac{\sigma_1 - \sigma_2}{2} = \frac{20 - 10}{2} = 5 \text{ MPa}$

165(B). Strain energy

$$= \int_0^L \frac{M_x^2 dx}{2EI} = \int_0^L \frac{(PX)^2 dx}{2EI} = \frac{P^2 L^3}{6EI}$$

166(D). For rigid-joined plane frames or beams, the total number of independent degrees of freedom is nothing but kinematic indeterminacy, that is

$D_k = 3j - r_e$

Here $j = 3$, $r_e = 1 + 1 + 3 = 5$

$D_k = 3 \times 3 - 5 = 4$