



Post Graduate School
Indian Agricultural Research Institute, New Delhi
Examination for Admission to Ph.D. Programme 2013-2014

Discipline : Water Science and Technology

Discipline Code : 23

Roll No.

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Please Note:

- (i) This question paper contains **12** pages. **Please check whether all the pages are printed in this set.** Report discrepancy, if any, **immediately** to the invigilator.
- (ii) **There shall be NEGATIVE marking for WRONG answers in the Multiple Choice type questions (No. 1 to 130) which carry one mark each. For every wrong answer 0.25 mark will be deducted.**

PART – I (General Agriculture)

Multiple choice questions (No. 1 to 30). Choose the correct answer (a, b, c or d) and enter your choice in the circle (by shading with a pencil) on the OMR - answer sheet as per the instructions given on the answer sheet.

1. Who is the present Chairman of Protection of Plant Varieties and Farmers' Right Authority (PPV&FRA)?
 - a) Dr. R.R. Hanchinal
 - b) Dr. P.L. Gautam
 - c) Dr. S. Nagarajan
 - d) Dr. Swapan K. Datta
2. Which among the following is another name for vitamin B₁₂?
 - a) Niacin
 - b) Pyridoxal phosphate
 - c) Cobalamin
 - d) Riboflavin
3. The largest share in India's farm export earning in the year 2011-12 was from
 - a) Basmati rice
 - b) Non-basmati rice
 - c) Sugar
 - d) Guar gum
4. The National Bureau of Agriculturally Important Insects was established by ICAR in _____, was earlier known as _____.
 - a) Bangalore; PDBC
 - b) New Delhi; National Pusa Collection
 - c) Ranchi; Indian Lac Research Institute
 - d) New Delhi; NCIPM
5. The most important sucking pests of cotton and rice are respectively
 - a) *Nilaparvata lugens* and *Aphis gossypii*
 - b) *Aphis gossypii* and *Thrips oryzae*
 - c) *Amrasca biguttula biguttula* and *Scirtothrips dorsalis*
 - d) *Thrips gossypii* and *Orseolia oryzae*
6. Which of the following microorganism causes fatal poisoning in canned fruits and vegetables?
 - a) *Aspergillus flavus*
 - b) *Penicillium digitatum*
 - c) *Clostridium botulinum*
 - d) *Rhizoctonia solani*
7. The cause of the great Bengal Famine was
 - a) Blast of rice
 - b) Brown spot of rice
 - c) Rust of wheat
 - d) Karnal bunt of wheat
8. Actinomycetes belong to
 - a) The fungi
 - b) Eukaryote
 - c) *Mycelia sterilia*
 - d) None of the above
9. A virus-free clone from a virus infected plant can be obtained by
 - a) Cotyledonary leaf culture
 - b) Axenic culture
 - c) Stem culture
 - d) Meristem tip culture
10. Which of the following is not an objective of the National Food Security Mission?
 - a) Sustainable increase in production of rice, wheat and pulses
 - b) Restoring soil fertility and productivity at individual farm level
 - c) Promoting use of bio-pesticides and organic fertilizers
 - d) Creation of employment opportunities

11. Agmarknet, a portal for the dissemination of agricultural marketing information, is a joint endeavour of
 - a) DMI and NIC
 - b) DMI and Ministry of Agriculture
 - c) NIC and Ministry of Agriculture
 - d) DMI and Directorate of Economics and Statistics
12. The share of agriculture and allied activities in India's GDP at constant prices in 2011-12 was
 - a) 14.1%
 - b) 14.7%
 - c) 15.6%
 - d) 17.0%
13. The average size of land holding in India according to Agricultural Census 2005-06 is
 - a) 0.38 ha
 - b) 1.23 ha
 - c) 1.49 ha
 - d) 1.70 ha
14. 'Farmers First' concept was proposed by
 - a) Paul Leagans
 - b) Neils Rolling
 - c) Robert Chamber
 - d) Indira Gandhi
15. In the year 2012, GM crops were cultivated in an area of
 - a) 150 million hectare in 18 countries
 - b) 170 million hectare in 28 countries
 - c) 200 million hectare in 18 countries
 - d) 1.70 million hectare in 28 countries
16. The broad-spectrum systematic herbicide glyphosate kills the weeds by inhibiting the biosynthesis of
 - a) Phenylalanine
 - b) Alanine
 - c) Glutamine
 - d) Cysteine
17. At harvest, the above ground straw (leaf, sheath and stem) weight and grain weight of paddy crop are 5.5 and 4.5 tonnes per hectare, respectively. What is the harvest index of paddy?
 - a) 45%
 - b) 50%
 - c) 55%
 - d) 100%
18. Crossing over between non-sister chromatids of homologous chromosomes takes place during
 - a) Leptotene
 - b) Pachytene
 - c) Diplotene
 - d) Zygotene
19. The term 'Heterosis' was coined by
 - a) G.H. Shull
 - b) W. Bateson
 - c) T.H. Morgan
 - d) E.M. East
20. When a transgenic plant is crossed with a non-transgenic, what would be the zygosity status of the F_1 plant?
 - a) Homozygous
 - b) Heterozygous
 - c) Hemizygous
 - d) Nullizygous
21. The highest per capita consumption of flowers in the world is in
 - a) The USA
 - b) India
 - c) Switzerland
 - d) The Netherlands
22. Which of the following is a very rich source of betalain pigment?
 - a) Radish
 - b) Beet root
 - c) Carrot
 - d) Red cabbage
23. Dog ridge is
 - a) Salt tolerant rootstocks of mango
 - b) Salt tolerant rootstocks of guava
 - c) Salt tolerant rootstocks of grape
 - d) Salt tolerant rootstocks of citrus
24. Which of the following micronutrients are most widely deficient in Indian soils?
 - a) Zinc and boron
 - b) Zinc and iron
 - c) Zinc and manganese
 - d) Zinc and copper
25. Which of the following fertilizers is not produced in India?
 - a) DAP
 - b) Urea
 - c) Muriate of potash
 - d) TSP
26. What is the estimated extent of salt affected soils in India?
 - a) 5.42 mha
 - b) 7.42 mha
 - c) 11.42 mha
 - d) 17.42 mha
27. Which of the following is not a feature of watershed?
 - a) Hydrological unit
 - b) Biophysical unit
 - c) Socio-economic unit
 - d) Production unit

28. Correlation coefficient 'r' lies between
 a) 0 and 1
 b) -1 and 1
 c) -1 and 0
 d) 0 and ∞
29. For the data 1, -2, 4, geometric mean is
 a) 2
 b) 4
 c) $-\frac{7}{3}$
 d) -2
30. The relationship between Arithmetic mean (A), Harmonic mean (H) and Geometric mean (G) is
 a) $G^2=AH$
 b) $G=\sqrt{A+H}$
 c) $H^2=GA$
 d) $A^2=GH$

PART – II (Subject Paper)

Multiple choice questions (No. 31 to 130). Choose the correct answer (a, b, c or d) and enter your choice in the circle (by shading with a pencil) on the OMR - answer sheet as per the instructions given on the answer sheet.

31. A drought in India is considered as a severe drought, when the production of the country due to drought falls
 a) Between 50% and 75% of the normal
 b) Between 25% and 50% of the normal
 c) Between 15% and 25% of the normal
 d) Below 15% of the normal
32. Which meteorological phenomenon helps in buildup of pollution levels in atmosphere?
 a) Radiation
 b) Thunder storm
 c) Rainfall
 d) Thermal inversion
33. First irrigation commission in India was constituted during the period
 a) 1898-1900
 b) 1901-1903
 c) 1905-1907
 d) 1910-1912
34. During wind erosion, the maximum amount of soil removal is due to
 a) Sheet
 b) Saltation
 c) Surface Creep
 d) Shifting

35. Number of meteorological sub-divisions in India are
 a) 18
 b) 30
 c) 35
 d) 45
36. Bhakra project is a
 a) Major irrigation project
 b) Minor irrigation project
 c) Medium irrigation project
 d) Major hydroelectric and irrigation project
37. Which of the following is not a computer language?
 a) Fortran
 b) Cobol
 c) C
 d) E
38. The form of one dimensional vertical infiltration process in which depth of infiltration (I) with time (t) is
 a) $I = at^b$
 b) $I = at^{-b}$
 c) $I = -at^b$
 d) $I = t^b$
39. In waterlogged soil the concentration is more of
 a) Ethane
 b) Methane
 c) CO_2
 d) Carbon monoxide (CO)
40. The head loss due to friction in pipe flow for a given discharge can be reduced by
 a) Increasing pipe length
 b) Increasing flow velocity
 c) Increasing the number of bends
 d) Increasing pipe diameter
41. Bulk density of soil normally decreases with increase of
 a) Sand particles
 b) Silt particles
 c) Clay particles
 d) Stone particles
42. An ideal fluid has
 a) Zero surface tension and is incompressible
 b) Zero shear stress and behaves as a perfect gas
 c) Constant density of viscosity
 d) Zero viscosity and is incompressible
43. The Kinematic viscosity ν is related to the dynamic viscosity μ and density ρ as $\nu=?$
 a) μ/ρ
 b) $\mu\rho$
 c) ρ/μ
 d) $\mu/\rho g$

44. In surge irrigation water is applied
- Under pressure
 - Intermittently
 - In small plots
 - Through a surface tank
45. Axial flow pump is ideal for
- Low discharge
 - High discharge
 - Pumping from tube-well
 - Pumping from dug well
46. Time versus rainfall graph is called
- Hydrograph
 - Hygrograph
 - Hyetograph
 - Histogram
47. Altimeter is used for measuring
- Height of a place from msl
 - Air temperature
 - Longitude of a place
 - Ground water level
48. Soluble salts in ground water originate mainly from
- The recharge of contaminated water
 - The excessive irrigation water percolating through the root zones of cultivated area
 - The solution of the rock material
 - The water originally entrapped in sedimentary strata since the time of deposition
49. The damage due to seepage line to the earthen dam of an embankment type water harvesting structure may be checked by
- Increasing the width of the dam
 - Increasing the length of the dam
 - Increasing the height of the dam
 - Increasing the depth of the dam foundation
50. Irrigation with saline water provides better results under
- Shallow water table level conditions
 - Suitable selection of crops
 - Conjunctive use of saline water
 - Well-drained sub-surface conditions
51. An arrangement in which soil particles are oriented edge-to-edge or edge-to-face with respect to one another, it is called
- Honeycomb structure
 - Flocculent structure
 - Dispersed structure
 - Cohesive matrix
52. The highest water requiring crop is
- Wheat
 - Maize
 - Tomato
 - Cotton
53. Conjunctive use of water in a basin means
- Combined use of water for irrigation and hydro power generation
 - Combined use of surface and ground water resources
 - Use of irrigation water for both *Rabi* and *Kharif* crops
 - The sum of evapotranspiration and the amount use up in plant metabolism
54. The drag coefficient as predicted by the Stokes' law
- Increases with the Reynolds's number
 - Decreases with the Reynolds's number
 - Is independent of the Reynolds's number
 - Depends upon the energy of the falling object
55. CADA stands for
- Command Area Development Authority
 - Command Area Development Agency
 - Central Agricultural Development Agency
 - None of the above
56. The total number of isotopes of elemental hydrogen is
- 2
 - 3
 - 4
 - 5
57. Pump efficiency is the ratio of
- Water horse power and drive efficiency
 - Water horse power and shaft horse power
 - Shaft horse power and motor efficiency
 - Discharge and water horse power
58. One atmosphere is equal to
- 100 Pa
 - 101.3 Pa
 - 10.13 kPa
 - 101.3 kPa
59. Darcy's law is invalid for flow which is
- Non-turbulent
 - Non-laminar
 - Laminar
 - Saturated
60. Equinox is related to
- January 26
 - September 23
 - December 23
 - August 15
61. The Auger-hole method is used for determining
- Bulk density
 - Hydraulic conductivity
 - Soil depth
 - Deep percolation

62. Which one of the following is not a permanent structure?
a) Drop spillway
b) Chute spillway
c) Drop inlet
d) Contour bund
63. Most of the weather phenomenon take place in the
a) Stratosphere
b) Mesosphere
c) Troposphere
d) Ionosphere
64. The fundamental equation describing saturated flow in a porous media is attributed to
a) Darcy
b) Navier-Stokes
c) Dupuit-Forchheimer
d) Kozeny
65. The instrument used to measure the area on a map with irregular boundary is known as
a) Pantograph
b) Planimeter
c) Tachometer
d) Scale
66. The bond angle in water molecule is
a) 60°
b) 100°
c) 105°
d) 180°
67. Total number of Agro-ecological zones in the country is
a) 8
b) 21
c) 38
d) 100
68. Sugar is dissolved in water due to
a) Dipole
b) H^+ bonding
c) Low pH
d) Higher energy
69. As per Thornthwaite climatic classification, Delhi's climate is
a) Arid
b) Semi-arid
c) Humid
d) Moist
70. Out of four field crops, the highest salt tolerant crop is
a) Maize
b) Gram
c) Pea
d) Mustard
71. Potato crop should be irrigated at available water depletion of
a) 25%
b) 50%
c) 80%
d) 100%
72. Which drought year in India was connected with El Nino?
a) 1918
b) 1972
c) 1982
d) 1986
73. Nagarjuna Sagar irrigation project is located in
a) Tamil Nadu
b) Karnataka
c) Andhra Pradesh
d) Maharashtra
74. High NO_3^- content in drinking water causes a disease called
a) Night blindness
b) Chlorosis
c) Paralysis
d) Blue baby
75. Centrifugal pump lifts the water efficiently from the depth of
a) 7 m
b) 12 m
c) 20 m
d) Unlimited
76. Lines joining places of equal cloudiness are called
a) Isotachs
b) Isohyets
c) Isoneph
d) Isogons
77. The number of classes in land capability classification are
a) 4
b) 8
c) 10
d) 16
78. Sukho Majri watershed is nearby
a) Pune
b) Alwar
c) Chandigarh
d) Karnal
79. Seeding material for artificial rain is
a) Urea
b) Sulphuric acid
c) Cetyl alcohol
d) Silver iodide

80. Identify the low head and very high discharge pump
- Centrifugal pump
 - Turbine pump
 - Propeller pump
 - Submersible pump
81. In a fluid flow, the Bernoulli's Theorem pertains to the "Law of Conservation of Energy". This theorem is valid for
- Uniform flow
 - Steady flow of ideal fluid
 - Steady flow only
 - Real fluid only
82. In case of flow through pipes Reynolds Number is a function of density, dynamic viscosity, mean velocity of flow and
- Surface tension
 - Pressure force
 - Pipe diameter
 - Pipe friction
83. Theoretically dimension of Manning's roughness coefficient is
- (Length)^{3/2}
 - (Length)^{1/2}
 - (Length)^{1/6}
 - Dimensionless
84. A tensiometer is a device for measuring
- Water potential
 - Gravitational potential
 - Matric potential
 - Pressure potential
85. Kriging is a technique used for
- Vector Analysis
 - Numerical Analysis
 - Interpolation
 - Extrapolation
86. Gross irrigation requirement of a crop is 3.5 mm/day. Calculate the net irrigation requirement if efficiency of the irrigation method is 80% and irrigation interval is two weeks.
- 30 mm
 - 35 mm
 - 38 mm
 - 45 mm
87. The time of concentration needed in the rational formula for predicting the runoff from a catchment area
- Increases with the length of the catchment
 - Decreases with the average slope of the catchment
 - Increases with the length of the flow
 - Decreases with the durations of rainfall
88. The infiltration rate of water into a soil is inversely proportional to the
- Elapsed time
 - Square of the elapsed time
 - Square root of the elapsed time
 - Cubic root of the elapsed time
89. Soil water flow in an unsaturated zone occurs due to
- Hydraulic force and hydraulic conductivity
 - Hydraulic conductivity and matric potential gradient
 - Hydraulic conductivity and osmotic potential gradient
 - Gravitational and matric potential gradient
90. The Antecedent Moisture Condition-III (AMC-III) of soils has the
- Lowest runoff potential
 - Moderately high runoff potential
 - Highest runoff potential
 - Moderately low runoff potential
91. On global basis, India's share in water resources is
- 4%
 - 10%
 - 20%
 - 30%
92. Which kind of pumps need priming?
- Hand pumps
 - Positive displacement pump
 - Centrifugal pump
 - Submersible pump
93. Water is a universal solvent because it is/has
- Liquid
 - Found everywhere
 - pH value 7
 - High dielectric constant
94. The diameter of the rainfall collector in Symon's rain gauge is
- 5 cm
 - 8 cm
 - 12.7 cm
 - 32 cm
95. The pan coefficient of class 'A' pan evaporimeter is taken as
- 0.007
 - 0.7
 - 5.5
 - 7.0
96. In shallow stream, the velocity measurement is taken at
- 0.2 of water depth
 - 0.6 of water depth
 - 1.0 of water depth
 - 1.2 of water depth

97. Linking of river basins in India may create an additional irrigation potential of about
- 5 m.ha.
 - 25 m.ha.
 - 90 m.ha.
 - 100 m.ha.
98. A gross water way has discharge of 0.32 cu.m. per second and drains 260 ha. The drainage coefficient of this land is
- 0.9 mm
 - 6.7 mm
 - 10.6 mm
 - 12.9 mm
99. Type of erosion whose effect is reflected only in reduced yields
- Gully
 - Stream bank
 - Rill
 - Sheet
100. If electrical conductivity of a water sample is 2.0 dSm^{-1} , total amount of dissolved electrolytes will be approximately
- 50 mgL^{-1}
 - 100 mgL^{-1}
 - 1280 mgL^{-1}
 - 10000 mgL^{-1}
101. During wind erosion, finer soil particles of 0.002 mm diameter move in the
- Surface creep
 - Suspension
 - Saltation
 - Sheet
102. TDR (Time Domain Reflectometer) instrument works on the principle of changes in the property of the medium
- Diffusivity
 - Resistance
 - Conductivity
 - Di-electric
103. For irrigating wheat crop, 8 cm of water is to be applied. If irrigation efficiency is 80%, total depth of water to be applied will be
- 5 cm
 - 8 cm
 - 10 cm
 - 15 cm
104. Hydraulic structures are designed to withstand the
- Stream flow
 - Intense rainfall
 - Wind speed
 - Peak flood
105. Grass waterways are designed for a recurrence interval of
- 10 months
 - 5 years
 - 10 years
 - 15 years
106. Sodium adsorption ratio (SAR) of water is expressed as
- Mg L^{-1}
 - me kg^{-1}
 - $(\text{me L}^{-1})^{1/2}$
 - $(\text{me L}^{-1})^{-1/2}$
107. Redox potential (E^h) of a highly waterlogged soil is
- 100 mV
 - 400 mV
 - 400 mV
 - 50 mV
108. High RSC irrigation water is rich in
- Chloride
 - Sulphate
 - Nitrate
 - Bicarbonate
109. Attribute table is used in
- GIS
 - GPS
 - Contour
 - Maning
110. The dielectric constant of water at 20°C is
- 70
 - 72
 - 80
 - 90
111. Lines joining the places of equal sunshine hours are called
- Isotherm
 - Isotones
 - Isohels
 - Isotopes
112. Which crop is more tolerant to salinity?
- Peas
 - Mustard
 - Onion
 - Tomato
113. If height of water column is 1000 cm, in terms of pF it is equivalent to
- 1.0
 - 2.5
 - 3.0
 - 8.2

114. Ultimate irrigation potential in India is approximately
- 100 Mha
 - 200 Mha
 - 139.7 Mha
 - 500 Mha
115. Potential energy of water in soil solution as compared to pure water is
- Higher
 - Lower
 - Equal
 - Positive
116. Most drip irrigation emitters operate at a pressure ranging from
- 0-10 m
 - 2-14 m
 - 5-33 m
 - 10-20 m
117. The pressure at the surface of the water table is equal to
- 0.2 atm
 - 0.5 atm
 - 1.0 atm
 - 1.6 atm
118. The term 'Osrabandhi' relates to
- Water pricing
 - Water sharing
 - Land management
 - Privatisation of water
119. Curing is the process related to the crops like
- Cotton
 - Soybean
 - Tobacco
 - Groundnut
120. USLE predicts the
- Seasonal soil loss
 - Monthly soil loss
 - Average annual soil loss
 - Soil loss due to an isolated storm
121. Water use efficiency indicates the ratio of
- Yield and water applied
 - Harvest index
 - Biomass and yield
 - Yield and consumptive use
122. A Hygrograph records
- Humidity
 - Vapour pressure
 - Rainfall
 - Sunshine
123. Curve numbers method is for estimation of
- Discharge
 - Runoff
 - Velocity
 - Sediment
124. Water boils only when vapour pressure and atmospheric pressure are
- Equal
 - Additive
 - Negative
 - Upward
125. FCC is a term usually associated with
- GPS
 - GIS
 - Remote sensing
 - Colour matching
126. Drip irrigation has high acreage in the state of
- Uttar Pradesh
 - Bihar
 - Madhya Pradesh
 - Maharashtra
127. Lux is a unit of
- Temperature
 - Frost
 - Light illumination
 - Rain
128. Bulk density of soil normally decreases with the increase of
- Clay particles
 - Silt particles
 - Sand particles
 - Gravel
129. The headquarters of International Water Management Institute is in
- Colombo
 - Rome
 - Paris
 - Washington
130. One horsepower (hp) is equal to
- 745.7 kw
 - 1.78 k cal/sec
 - 0.746 kw
 - 745 wh

Matching type questions (No. 131 to 140); all questions carry equal marks. Choose the correct answer (a, b, c, d or e) for each sub-question (i, ii, iii, iv and v) and enter your choice in the circle (by shading with a pencil) on the OMR - answer sheet as per the instructions given on the answer sheet.

131.

- | | |
|----------------------------|-------------------------------------|
| i) Bernoulli's Theorem | a) Viscous force |
| ii) Fick's law | b) Incompressible fluid flow system |
| iii) Darcy's law | c) Concentration gradient |
| iv) Stokes' law | d) Hydraulic gradient |
| v) Hazen-Williams equation | e) Head loss in pipeline friction |

132.

- | | |
|---------------------|----------------|
| i) Pressure | a) Bars |
| ii) Distance | b) Ohms |
| iii) Radioactivity | c) Light years |
| iv) Light intensity | d) Curie |
| v) Resistance | e) Lux |

133. Match the name of the scientist with concerned characteristic

- | | |
|----------------|---------------------------------|
| i) Siemens | a) Gypsum requirement |
| ii) Pascal | b) Acidity and alkalinity scale |
| iii) Hertz | c) Electrical conductivity |
| iv) Schoonover | d) Pressure |
| v) Sorenson | e) Frequency |

134. Match the soil erosion process with its control measure

- | | |
|-----------------------|-----------------------------|
| i) Splash erosion | a) Contour cultivation |
| ii) Wind erosion | b) Drop structure |
| iii) Gully erosion | c) Natural balance |
| iv) Sheet erosion | d) Cover crops |
| v) Geological erosion | e) Shelterbelts/wind breaks |

135. Match the property of substance with unit of measurement

- | | |
|-----------------------------|--------------------------|
| i) Density | a) $d \text{ Sm}^{-1}$ |
| ii) Viscosity | b) mg L^{-1} |
| iii) Hardness | c) Mg m^{-3} |
| iv) Electrical conductivity | d) Poise |
| v) Surface tension | e) dyne cm^{-1} |

136. Match the soil texture with the depth of available water (cm/m)

- | | |
|-----------------|----------|
| i) Clay | a) 2-4 |
| ii) Clay loam | b) 4-16 |
| iii) Sandy loam | c) 6-13 |
| iv) Silt loam | d) 10-18 |
| v) Fine sand | e) 16-13 |

137. Match the river basin with the country

- | | |
|------------------------|-----------|
| i) Amazon basin | a) China |
| ii) Hawand Ho basin | b) Egypt |
| iii) Mississippi basin | c) India |
| iv) Nile basin | d) Brazil |
| v) Brahmaputra basin | e) USA |

138. Match the growing period with the crop

- | | |
|----------------|-----------------|
| i) Sorghum | a) 180-200 days |
| ii) Green gram | b) 90-110 days |
| iii) Sunflower | c) 150-180 days |
| iv) Chillies | d) 60-75 days |
| v) Red gram | e) 100-120 days |

139.

- | | |
|------------------------|----------------------------------|
| i) Fog | a) Horse latitudes |
| ii) Snow | b) Foot candles |
| iii) Ozone layer | c) Form of precipitation |
| iv) Light intensity | d) Hanging cloud near the ground |
| v) High pressure belts | e) Stratosphere |

140. Match the activities with objectives

- | | |
|---------------------------|--------------------------|
| i) Peoples' participation | a) Ecological balance |
| ii) Rain water harvesting | b) Water requirement |
| iii) Farm forestry | c) Watershed |
| iv) Transplanting | d) Ground water recharge |
| v) Irrigation scheduling | e) Rice |

Short questions (No. 141 to 146); each question carries FIVE marks. Write answers, including computation / mathematical calculations if any, in the space provided for each question on the question paper itself.

141. A watercourse in a canal water delivery system has a discharge of 30 lps and irrigates an area of 42 hectares in a week. Calculate the average depth of irrigation.

142. A sprinkler irrigation system with 20 m × 10 m spacing has a nozzle discharge of 1.00 lps. Calculate its application rate in cm/hr.

143. List different soil water constants. Draw a sketch showing the constants with their respective tensions.

144. Write in brief the methods of irrigation scheduling.

145. List different methods of soil moisture determination. Write in brief the principle of neutron moisture meter.

146. Differentiate between irrigation requirement and crop water requirement. Name the methods of evapotranspiration estimation.