DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

Test Booklet No. : 00113

Series A

TEST BOOKLET

AGRICULTURE ENGINEERING

Time Allowed : 2 Hours **Full Marks : 200**

Read the following instructions carefully before you begin to answer the questions :

1. The name of the Subject, Roll Number as mentioned in the Admission Certificate, Test Booklet No. and Series are to be written legibly and correctly in the space provided on the Answer-Sheet with Black/Blue ballpoint pen.
2. **Answer-Sheet without marking Series as mentioned above in the space provided for in the Answer-Sheet shall not be evaluated.**
3. All questions carry equal marks.
   The Answer-Sheet should be submitted to the Invigilator.
   Directions for giving the answers : Directions for answering questions have already been issued to the respective candidates in the 'Instructions for marking in the OMR Answer-Sheet' along with the Admit Card and Specimen Copy of the OMR Answer-Sheet.
   Example :
   Suppose the following question is asked :
   The capital of Bangladesh is
   (A) Chennai
   (B) London
   (C) Dhaka
   (D) Dhubri
   You will have four alternatives in the Answer-Sheet for your response corresponding to each question of the Test Booklet as below :

   Ⓐ Ⓑ Ⓒ Ⓓ

   In the above illustration, if your chosen response is alternative (C), i.e., Dhaka, then the same should be marked on the Answer-Sheet by blackening the relevant circle with a Black/Blue ballpoint pen only as below :

   Ⓐ Ⓑ ● Ⓓ

   The example shown above is the only correct method of answering.
4. Use of eraser, blade, chemical whitener fluid to rectify any response is prohibited.
5. Please ensure that the Test Booklet has the required number of pages (16) and 100 questions immediately after opening the Booklet. In case of any discrepancy, please report the same to the Invigilator.
6. No candidate shall be admitted to the Examination Hall/Room 20 minutes after the commencement of the examination.
7. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/Invigilator. No candidate shall be permitted to hand over his/her Answer-Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.
8. No Mobile Phone, Electronic Communication Device, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Electronic Communication Device, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.
9. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected papers permitted by the Commission.
10. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.
11. This Test Booklet can be carried with you after answering the questions in the prescribed Answer-Sheet.
12. Noncompliance with any of the above instructions will render a candidate liable to penalty as may be deemed fit.
13. No rough work is to be done on the OMR Answer-Sheet. You can do the rough work on the space provided in the Test Booklet.

N.B. : There will be negative marking @ 0·25 per 1 (one) mark against each wrong answer.

SEAL

[No. of Questions : 100]

1. A geological formation which is essentially impermeable for flow of water even though it may contain water in its pores is called

(A) aquitard

(B) aquiclude

(C) aquifer

(D) aquifuge

2. The lines of equal depth of ground-water level are

(A) isobaths

(B) isochrones

(C) isolytes

(D) isolines

3. The most efficient cross-section of an open channel from the hydraulic point of view is

(A) parabolic

(B) square

(C) semicircular

(D) trapezoidal

4. Hydrometry is the

(A) practice of hydrograph analysis

(B) science of measurement of flow

(C) science of soil measurement

(D) practice of hydrometer

5. Linear measurements only are made in which type of surveying?

(A) Chain surveying

(B) Contour surveying

(C) Dumpy level

(D) Theodolite surveying

6. Which type of the following branches of surveying is used to find the elevations of given points with respect to given or assumed datum?

(A) Traversing

(B) Indirect surveying

(C) Contouring

(D) Levelling

7. A series of closely spaced contour lines represents

(A) plane slope

(B) steep slope

(C) uniform slope

(D) gentle slope

8. The type of bearing generally used to support the discs on a standard disc plough is

(A) bush bearing

(B) tapered roller bearing

(C) ball bearing

(D) disc harrow bearing

9. A frog of an animal-drawn mould board plough is made up of

(A) steel

(B) cast iron

(C) carbon steel

(D) soft steel

10. The cutter bar of a tractor-operated mower makes

(A) 800–1500 strokes/min

(B) 1200–1300 strokes/min

(C) 1500–1800 strokes/min

(D) 2000–2200 strokes/min

11. A ridger is used for

(A) earthing up

(B) making field furrow

(C) slope construction

(D) nursery making

12. When is the fluid called laminar?

(A) Reynolds number is less than 2000

(B) Viscosity of fluid is low

(C) Reynolds number is greater than 2000

(D) Density of fluid is high

13. When a fluid is subjected to resistance, it undergoes a volumetric change due to

(A) compressibility

(B) stress

(C) strain

(D) cohesion

14. The specific gravity of liquid has

(A) same unit as that of specific gravity of gas

(B) no unit

(C) same unit as that of mass of liquid

(D) same unit as that of specific volume of liquid

15. Piezometric head is the sum of

(A) pressure head and datum head

(B) velocity head and pressure head

(C) velocity head and datum head

(D) velocity head, pressure head and datum head

16. Sprinkler irrigation system performance is considered satisfactory when the minimum value of uniformity coefficient is

(A) 85%

(B) 56%

(C) 98%

(D) 75%

17. The total depth of irrigation to a crop is known as

(A) base

(B) depth of water transmission

(C) duty

(D) delta

18. The discharge rate of drip emitters usually ranges from

(A) 2–10 Lit/min

(B) 2–10 Lit/hr

(C) 2–10 Lit/sec

(D) 2–10 Lit/day

19. If the discharge of drainage canal is 2000 liter per second and drainage area is 360 hectare, the drainage coefficient is

(A) 4·8 cm/day

(B) 48 cm/day

(C) 0·48 cm/day

(D) 4·0 cm/day

20. Lysimeter is used to measure

(A) infiltration

(B) depression losses

(C) evapotranspiration

(D) evaporation

21. The equation $Q = KIA$ represents

(A) Bernoulli's equation

(B) Rational formula

(C) Manning's formula

(D) Darcy's law

22. The graph between rainfall intensity and time is

(A) hyetogram

(B) hyetograph

(C) hydrograph

(D) mass curve

23. Piezometer is used to measure

(A) total pressure of soil surface

(B) static pressure of flowing liquid

(C) average pressure of turbulent fluid

(D) dynamic pressure of flowing fluid

24. For a fluid in motion, pressure at a point is same in all directions, then the fluid is

(A) a real fluid

(B) an ideal fluid

(C) a non-Newtonian fluid

(D) a Newtonian fluid

25. Viscosity is a property that manifests

(A) between two adjacent fluid layers in relative motion

(B) at solid boundaries only

(C) in uniform fluid layers

(D) only in turbulent flow

26. The intensity duration frequency curves for precipitation indicate that

(A) the intensity of rainfall decreases as the duration decreases

(B) the greater the intensity of rainfall the shorter length of time it continues

(C) the greater the intensity, longer the duration

(D) in higher elevation, the intensity of rainfall decreases

27. For the growth of plants, the useful soil moisture is

(A) under rock water

(B) precipitation

(C) gravity water

(D) capillary water

28. The seepage line may be defined as the

(A) line below which there is gravitational pressure

(B) line above which there is no hydrostatic pressure and below which there is hydrostatic pressure

(C) line above which there is no hydrostatic pressure

(D) line below which there is hydrostatic pressure

29. Class IV land is

(A) exceptionally suitable for cultivation

(B) marginally suitable for cultivation

(C) not suitable for cultivation

(D) suitable only during rainy season for cultivation

30. The safe entrance velocity through a well screen is

(A) 0·03 m/s

(B) 0·3 m/s

(C) 3 m/s

(D) 30 m/s

31. When a thin and fairly uniform layer of soil is removed from land surface by runoff, it is called

(A) geological erosion

(B) gully erosion

(C) glacial erosion

(D) sheet erosion

32. Erodibility refers to the potential ability of

(A) soil to be eroded by external forces like rain

(B) rain drop and blowing wind to remove the particles

(C) net erosion per unit area

(D) sediment yield per unit area

33. In hydraulic sprayers, the degree of atomization is primarily a function of

(A) shape of the atomizer

(B) size of the atomizer

(C) velocity of air

(D) liquid pressure and nozzle characteristics

34. Seed metering devices of seed drills consists of

(A) fluted wheels

(B) rotary wheels

(C) double run wheels

(D) horizontal plate with cells

35. Which of the following are primary tillage equipments?

(A) Disc plough and disc harrow

(B) Disc plough and cultivator

(C) Rollers and power harrows

(D) Mould board plough and sub-soiler

36. Worm gears are used for transmitting power between two shafts

(A) at 60° angle

(B) at 30° angle

(C) at right angle to each other and cannot intersect each other

(D) at right angle to each other and can intersect each other

37. Depth of working of tillage implement is controlled by

(A) cage wheel

(B) gauge wheel

(C) rear wheel

(D) furrow wheel

38. Combustion process is

(A) isothermal

(B) adiabatic

(C) exothermic

(D) endothermic

39. Timing order of a six-cylinder engine which is designed to ensure that no adjacent cylinder have power stroke consecutively is

(A) 1–5–4–6–2–4

(B) 1–2–3–4–5–6

(C) 1–5–3–6–2–4

(D) 1–4–3–5–6–2

40. Slump test for cement is carried out to determine

(A) strength

(B) workability

(C) thickness

(D) durability

41. Standard PTO speed is

(A) 540 r.p.m.

(B) 635 r.p.m.

(C) 750 r.p.m.

(D) 100 r.p.m.

42. The type of starting aid generally used in diesel power tiller is

(A) fuel plug

(B) intake manifold

(C) piston

(D) decompression lever

43. The main difference between flywheel and governor is that

(A) flywheel is heavier than governor

(B) flywheel acts as an energy reservoir and governor controls engine speed

(C) flywheel is fixed to the crankshaft while governor is not

(D) None of the above

44. Break horsepower (BHP) is the measure of

(A) engine's power at the flywheel

(B) engine's power at the drawbar

(C) frictional power of an engine

(D) ignition rate of an engine

45. The contour cultivation is most effective on slope

(A) 5% to 15%

(B) 3% to 8%

(C) 10% to 15%

(D) 15% to 20%

46. Mass curve is the plot of accumulated

(A) precipitation and time

(B) evaporation and time

(C) transpiration and time

(D) precipitation and intensity

47. Soil particles may be splashed to a height of 60 cm and move laterally to a distance of 150 cm, if the speed of falling rain drop is

(A) 500 km/hr

(B) 15 km/hr

(C) 50 km/hr

(D) 150 km/hr

48. Universal soil loss equation (USLE) computes

(A) soil erosion

(B) sediment yield

(C) annual soil loss

(D) average annual soil loss

49. Contour bunding is most suitable for areas having

(A) flat land with no slope

(B) low rainfall and gentle slope

(C) high rainfall and steep slope

(D) sandy deserts

50. The structure used to reduce the velocity of flowing water in gullies is

(A) contour bund

(B) check dam

(C) field drain

(D) diversion channel

51. The type of wind erosion in which soil moves in short bounces is called

(A) suspension

(B) saltation

(C) surface creep

(D) sheet erosion

52. The size of the seed drill is expressed by

(A) amount of seed sown per unit time

(B) length × width of the machine

(C) area covered per unit time

(D) the number of furrow openers × distance between two furrow openers

53. Moving the centre of gravity of a tractor towards its front wheel creates the problem of

(A) instability

(B) steering

(C) overturning

(D) None of the above

54. The scientific method of storing grains in bulk under airtight condition is known as

(A) bag storage

(B) barn storage

(C) silo storage

(D) heap storage

55. In warehouse construction for grain storage, the floor should be

(A) wooden plank

(B) earthen

(C) raised concrete floor

(D) clay tiles

56. An aquifer is a geological formation which

(A) does not contain water

(B) is a rock outcrop

(C) contains water but does not transmit

(D) contains and also transmits water

57. A stream which contributes runoff to groundwater is known as

(A) influent stream

(B) effluent stream

(C) perennial stream

(D) ephemeral stream

58. Which of the following is major disadvantage of canal irrigation?

(A) Water logging and salinity

(B) Assured water supply

(C) Increased crop yield

(D) Reduced soil fertility

59. The duty of water at the head of a distributary canal is defined as

(A) area irrigated per unit depth of water at field level

(B) volume of water supplied per unit time

(C) depth of water stored in the dam reservoir

(D) area irrigated per cumec of discharge at canal head

60. The permissible velocity in an unlined canal section is governed primarily by

(A) canal slope only

(B) type of crop irrigated

(C) non-scouring and non-silting conditions of soil

(D) quantity of discharge

61. The line connecting points of equal elevation on the ground is called

(A) benchmark

(B) axis line

(C) contour

(D) datum line

62. Which instrument is commonly used for measuring horizontal and vertical angles?

(A) Dumpy level

(B) Theodolite

(C) Prismatic compass

(D) Planimeter

63. In levelling, the staff reading taken on a point of known elevation is called

(A) intermediate sight (IS)

(B) fore sight (FS)

(C) back sight (BS)

(D) reduced sight (RS)

64. What is the range of compression ratio in diesel engine?

(A) 4 : 1 to 8 : 1

(B) 14 : 1 to 22 : 1

(C) 8 : 1 to 14 : 1

(D) 11 : 1 to 24 : 1

65. The ratio of the volume of the voids to the volume of soil solid in the given soil mass is called as

(A) void ratio

(B) porosity

(C) specific gravity

(D) air content

66. Energy per unit weight of fluid with respect to datum is known as

(A) specific energy

(B) head

(C) pressure energy

(D) velocity head

67. In uniform flow, the flow parameters in a channel reach do not vary with

(A) time

(B) space

(C) time and space

(D) None of the above

68. Slope of energy gradient line is called

(A) hydraulic slope

(B) energy slope

(C) bed slope

(D) bottom slope

69. In case of critical flow condition, the hydraulic depth is equal to

(A) half of the velocity head

(B) twice the velocity head

(C) velocity head

(D) None of the above

70. By using Lacey's theory for designing canal, the velocity depends on many factors, *except*

(A) bed slope of canal

(B) hydraulic mean depth

(C) hydraulic silt factors

(D) total available depth of water

71. When is a fluid called turbulent?

(A) Density of fluid is high

(B) Viscosity of fluid is high

(C) Reynolds number is less than 1000

(D) Reynolds number is greater than 2000

72. Bernoulli's equation is applied to

(A) pitot tube meter

(B) orifice meter

(C) venturi meter

(D) All of the above

73. The head over a V-notch at the end of a channel is 65 cm. If error of 0·25 cm is possible in the head measurement, then the percentage error in estimating discharge would be

(A) 0·55

(B) 1·00

(C) 1·96

(D) 0·96

74. A sphere is settling down in a viscous liquid at Reynolds number of 0·2, what will be its drag coefficient?

(A) 120

(B) 180

(C) 24

(D) 48

75. In a fluid flow, the line of constant piezometric head passes through two points which have the same

(A) elevation

(B) volume

(C) dynamic pressure

(D) velocity

76. The break horsepower (BHP) of a centrifugal pump varies directly with

(A) pump velocity

(B) the speed of impeller diameter

(C) the square of the speed of impeller

(D) the cube of the speed of impeller

77. At optimum soil moisture constant, the dry density of soil will

(A) zero

(B) average

(C) maximum

(D) minimum

78. The coupling used when two shafts are appreciably out of line is

(A) flanged coupling

(B) universal coupling

(C) flexible coupling

(D) sleeve coupling

79. The integrating factor of differential equation

$$\frac{dy}{dx}(x \log x) + y = 2 \log x$$

is

(A) e^z

(B) $x \log x$

(C) $\log(\log x)$

(D) $\log x$

80. Full strength of concrete is achieved after

(A) 30 days

(B) 28 days

(C) 18 days

(D) 10 days

81. At 100% relative humidity, wet-bulb temperature of air is

(A) less than dew-point temperature

(B) more than dew-point temperature

(C) equal to dew-point temperature

(D) equal to dry-bulb temperature

82. Each standard cement bag has a volume of

(A) 0·035 m^3

(B) 1·35 m^3

(C) 35 m^3

(D) 0·038 cm^3

83. Ballast is sometimes used on front tyres of a 4-wheel tractor to

(A) decrease speed

(B) increase stability

(C) decrease wheel stability

(D) decrease tractor motion and vibration

84. Mufflers in tractor are provided to control

(A) engine speed

(B) fuel consumption

(C) noise

(D) vibration

85. The antiknock quality of petrol fuel is measured by

(A) cetane number

(B) octane number

(C) viscosity number

(D) calorific value

86. The power stroke of a 2-stroke engine is how many times the power stroke of a 4-stroke engine?

(A) Four

(B) Three

(C) Two

(D) Equal

87. The infiltration rate is at capacity rate if the intensity of rainfall is

(A) less than average rate of infiltration

(B) less than the initial infiltration capacity of soil

(C) equal to or greater than the initial infiltration capacity of soil

(D) equal to or greater than the average rate of infiltration

88. Soil moisture content

(A) decreases with increase in soil moisture tension

(B) remains same as soil moisture tension

(C) increases with increase in soil moisture tension

(D) decreases with increase in air pressure of soil

89. The most economical method of soil conservation is

(A) constructing dams

(B) constructing contour bunds

(C) constructing drains

(D) afforesting the area

90. The maximum value of $\sin x$ is

(A) -1

(B) 0

(C) 1

(D) ∞

91. If the determinant of a square matrix is zero, then the matrix is

(A) orthogonal

(B) symmetric

(C) singular

(D) non-singular

92. What are the parameters that affect traction in a tractor?

(A) Tyre width and diameter

(B) Soil type

(C) Weight

(D) All of the above

93. Define camber angle.

(A) Angle between the line of forward movement of the tractor and vertical line

(B) Angle between the centerline of the tractor and vertical line

(C) Angle between the centerline of the tyre and vertical line

(D) None of the above

94. Control valve used in cooling system of a tractor engine to control the flow of water when activated by temperature signal, is called

(A) radiator

(B) thermostat valve

(C) water jacket

(D) All of the above

95. How is mechanization level in agriculture field measured?

(A) kilowatt (kW)

(B) horsepower (HP)

(C) kW/Ha

(D) man-day

96. Which hitching system connects mounted implements to a tractor?

(A) Two-point linkage system

(B) Three-point linkage system

(C) By connecting to PTO

(D) Drawbar

97. Photovoltaic cells convert solar energy to

(A) electrical energy

(B) mechanical energy

(C) thermal energy

(D) All of the above

98. Lubricating oil pump of an IC engine is driven by

(A) crankshaft

(B) camshaft

(C) pulley connected to engine

(D) gear

99. For which condition, jet pump is used?

(A) For high head and high discharge of water

(B) For low head and high discharge of water

(C) For low head and low discharge of water

(D) None of the above

100. The vertical distance between the centerline of the pump shaft and centerline of the delivery pipe at the discharge end is called

(A) delivery head

(B) suction head

(C) zero head

(D) combine head

SPACE FOR ROUGH WORK