Discipline : Agricultural Engineering (*Agricultural Processing & Structures*)

Discipline Code : 03; *Sub code-01*   Roll No.

Please Note:

(i) This question paper contains 13 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. Which of the following crops have been approved for commercial cultivation in India?
   a) Bt cotton and Bt brinjal
   b) Bt cotton and Golden Rice
   c) Bt maize and Bt cotton
   d) Bt cotton only

2. This year (2010-11) the expected food grain production in India is
   a) 212 million tonnes
   b) 220 million tonnes
   c) 235 million tonnes
   d) 250 million tonnes

3. The genome of which of the following crops is still not completely sequenced?
   a) Rice
   b) Soybean
   c) Sorghum
   d) Wheat

4. According to the Approach Paper to the 12th Five Year Plan, the basic objective of the 12th Plan is
   a) Inclusive growth
   b) Sustainable growth
   c) Faster, more inclusive and sustainable growth
   d) Inclusive and sustainable growth

5. To address the problems of sustainable and holistic development of rainfed areas, including appropriate farming and livelihood system approaches, the Government of India has set up the
   a) National Rainfed Area Authority
   b) National Watershed Development Project for Rainfed Areas
   c) National Mission on Rainfed Areas
   d) Command Area Development and Water Management Authority

6. Which of the following sub-schemes are not covered under the Rashtriya Krishi Vikas Yojana?
   a) Extending the Green Revolution to eastern India
   b) Development of 60,000 pulses and oilseeds villages in identified watersheds
   c) National Mission on Saffron
   d) National Mission on Bamboo

7. The minimum support price for the common variety of paddy announced by the Government of India for the year 2010-11 was
   a) ₹ 1030
   b) ₹ 1000
   c) ₹ 980
   d) ₹ 950

8. According to the Human Development Report 2010 of the United Nations, India's rank in terms of the human development index is
   a) 119
   b) 134.
   c) 169
   d) 182

9. Which of the following does not apply to SRI method of paddy cultivation?
   a) Reduced water application
   b) Reduced plant density
   c) Increased application of chemical fertilizers
   d) Reduced age of seedlings

10. Which organic acid, often used as a preservative, occurs naturally in cranberries, prunes, cinnamon and cloves?
   a) Citric acid
   b) Benzoic acid
   c) Tartaric acid
   d) Lactic acid

11. Cotton belongs to the family
   a) Cruciferae
   b) Anacardiaceae
   c) Malvaceae.
   d) Solanaceae

12. Photoperiodism is
   a) Bending of shoot towards source of light
   b) Effect of light/dark durations on physiological processes
   c) Movement of chloroplast in cell in response to light
   d) Effect of light on chlorophyll synthesis

13. Ergot disease is caused by which pathogen on which host?
   a) *Claviceps purpurea* on rye
   b) *Puccinia recondita* on wheat
   c) *Drechlera sorokiniana* on wheat
   d) *Albugo candida* on mustard

14. Rocks are the chief sources of parent materials over which soils are developed. Granite, an important rock, is classified as
   a) Igneous rock
   b) Metamorphic rock
   c) Sedimentary rock
   d) Hybrid rock

15. Which one of the following is a *Kharif* crop?
   a) Pearl millet
   b) Lentil
   c) Mustard
   d) Wheat

16. The coefficient of variation (C.V.) is calculated by the formula
   a) (Mean/S.D.) × 100
   b) (S.D./Mean) × 100
   c) S.D./Mean
   d) Mean/S.D.

17. Which of the following is commonly referred to as muriate of potash?
   a) Potassium nitrate
   b) Potassium chloride
   c) Potassium sulphate
   d) Potassium silicate

18. Inbred lines that have same genetic constitution but differ only at one locus are called
   a) Multi lines
   b) Monohybrid
   c) Isogenic lines ,
   d) Pure lines

19. For applying 100 kg of nitrogen, how much urea would one use?
   a) 45 kg
   b) 111 kg
   c) 222 kg
   d) 333 kg

20. The devastating impact of plant disease on human suffering and survival was first realized by epidemic of
   a) Brown spot of rice in Bengal
   b) Late blight of potato in USA
   c) Late blight of potato in Europe
   d) Rust of wheat in India

21. The species of rice (*Oryza*) other than *O. sativa* that is cultivated is
   a) *O. rufipugon*
   b) *O. longisteminata*
   c) *O. glaberrima*
   d) *O. nivara*

22. The enzyme responsible for the fixation of CO_2 in mesophyll cells of C-4 plants is
   a) Malic enzyme
   b) Phosphoenol pyruvate carboxylase
   c) Phosphoenol pyruvate carboxykinase
   d) RuBP carboxylase

23. Which one of the following is a 'Vertisol'?
   a) Black cotton soil
   b) Red sandy loam soil
   c) Sandy loam sodic soil
   d) Submontane (Tarai) soil

24. What is the most visible physical characteristic of cells in metaphase?
   a) Elongated chromosomes
   b) Nucleus visible but chromosomes not
   c) Fragile double stranded loose chromosomes
   d) Condensed paired chromosomes on the cell plate

25. All weather phenomena like rain, fog and mist occur in
a) Troposphere
b) Mesosphere
c) Ionosphere
d) Ozonosphere

26. Which of the following elements is common to all proteins and nucleic acids?
a) Sulphur
b) Magnesium
c) Nitrogen
d) Phosphorous

27. Silt has intermediate characteristics between
a) Sand and loam
b) Clay and loam
c) Loam and gravel
d) Sand and clay

28. Certified seed is produced from
a) Nucleus seed
b) Breeder seed
c) Foundation seed
d) Truthful seed

29. Seedless banana is an
a) Autotriploid
b) Autotetraploid
c) Allotriploid
d) Allotetraploid

30. Which one of the following is used to test the goodness-of-fit of a distribution?
a) Normal test
b) t-test
c) Chi-square test
d) F-test

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 5 hp motor with mechanical efficiency of 60 per cent works for 2 hour. The energy consumed by the motor will be
a) 16.67 kwh
b) 12.5 kwh
c) 4.4 kwh
d) None of the above

32. A point moves in a straight line so that its displacement x metres at time 't' seconds is given by $x^2 = 1+t^2$. Its acceleration at a time 't' is
a) $1/x^3$
b) $-t/x^2$
c) $1/x - t^2/x^3$
d) $1/x - 1/x^2$

33. The half-life of radium is 1600 years. The fraction of a sample of radium that would remain after 6400 years is
a) 1/4
b) 1/2
c) 1/8
d) 1/16

34. Three identical dice are rolled. The probability that the same number will appear on each of them is
a) 1/6
b) 1/18
c) 1/36
d) 3/28

35. If λ_1 and λ_2 are the characteristic X-rays and gamma-rays respectively, then the relation between them is
a) $\lambda_1 = 1/\lambda_2$
b) $\lambda_1 = \lambda_2$
c) $\lambda_1 > \lambda_2$
d) $\lambda_1 < \lambda_2$

36. A rope 1 cm in diameter breaks if the tension in it exceeds 500 N. The maximum tension that may be given to a similar rope of diameter 2 cm is
a) 500 N
b) 1000 N
c) 1500 N
d) 2000 N

37. The theoretical husk content of common Indian pulses varies from
a) 5-10%
b) 10-15%
c) 15-20%
d) More than 20%

38. When a copper ball is heated, the largest percentage increase will be in its
a) Radius
b) Area
c) Volume
d) Mass

39. According to Janssen's theory, the lateral pressure in a deep bin is
a) $P_L = WR/\mu$
b) $P_L = KWR/\mu$
c) $P_L = WR/\mu \, [1-e^{(-K\mu h/R)}]$
d) None of the above

40. For a given source of radiation, the absorbance and reflectance values are 0.25 and 0.65, respectively for a surface. The value of the transmittance should be
a) 0.15
b) 0.10
c) 0.05
d) 0.00

41. Two towns A and B are 60 km apart. A school is to be built to serve 150 students in town A and 50 students in town B. If the total distance travelled by all 200 students is to be as small as possible, then the school should be built at
a) Town B.
b) 45 km from town A
c) Town A
d) 45 km from town B

42. The dimensional formula for Young's modulus is
a) $ML^{-1}T^2$
b) $ML^{-1}T^{-2}$
c) MLT^{-2}
d) $M^{-1}L^{-1}T^2$

43. Current in a circuit is wattless if
a) Inductance in the circuit is zero
b) Resistance in the circuit is zero
c) Current is alternating
d) Resistance and inductance both are zero

44. Thermal conductivity of a wall is increased to four times the existing value. Consequently, the conductive heat flux, other parameters remaining the same, in comparison to the initial value will be
a) 0.25 times
b) 0.5 times
c) 2 times
d) 4 times

45. A dimensionless number formed using thermal diffusivity, time and length is known as
a) Biot number
b) Fourier number
c) Prandtl number
d) Lewis number

46. A thermodynamic process taking place at constant volume is termed as
a) Isobaric
b) Isochoric
c) Isentropic
d) Adiabatic

47. Which of the following processes does not belong to milk processing?
a) Homogenization
b) Pasteurization
c) Cooling
d) Curing

48. What is the area requirement (m^2) for a cow in a stanchion barn?
a) 3.0
b) 6.0
c) 9.0
d) 12.0

49. 100 tonnes of paddy was harvested at 22% (w.b.) moisture content and it has to be brought to a moisture content of 15% (w.b.). What is the estimated weight of paddy after drying?
a) 90.4 t
b) 91.8 t
c) 93.0 t
d) 94.2 t

50. Other factors remaining same, lowering storage temperature by 5°C should
a) Reduce the storage period to half
b) Increase the storage period by 50%
c) Increase the storage period by a factor of two
d) Not affect the storage period significantly

51. One of the parameters of the performance of a cyclone separator is the particle diameter. The chance of a particle for separation
a) Increases linearly with the size of the particle
b) Decreases linearly with the particle diameter
c) Decreases with the square of the particle diameter
d) Increases with the square of the particle diameter

52. Moisture content in an agricultural produce is 80% (w.b.). Its moisture content on dry basis will be
a) 100%
b) 200%
c) 400%
d) 800%

53. The value of the differential $\frac{d}{dx}(\sin^{-1}x)$ is
a) $\frac{-1}{\sqrt{1-x^2}}$
b) $\frac{1}{\sqrt{1-x^2}}$
c) $\frac{1}{1+x^2}$
d) $\frac{-1}{1+x^2}$

54. In hyperbolic function, tanhx is equal to

a) $\dfrac{e^x - e^{-x}}{e^x + e^{-x}}$

b) $\dfrac{e^x + e^{-x}}{e^x - e^{-x}}$

c) $\dfrac{e^x + e^{-x}}{2}$

d) $\dfrac{e^x - e^{-x}}{2}$

55. In F-test, the test criterion F is the ratio of
a) Means
b) CV's
c) Variances
d) None of the above

56. The Stefan-Boltzman law is applicable for heat transfer by
a) Radiation
b) Conduction
c) Convection
d) Both conduction and convection

57. The main purpose of blanching of vegetables is to
a) Destroy bacteria
b) Destroy microorganisms
c) Inactivate enzymes
d) Accelerate enzymatic process

58. Thermal diffusivity ($\propto$) can be expressed as
a) $UA\Delta T$

b) $\dfrac{-(KA)}{(\Delta T/\Delta X)}$

c) $mC_p\Delta T$

d) $\dfrac{K}{\rho C_p}$

59. Convective heat transfer coefficient is expressed by the following dimensionless number
a) Prandtl
b) Grashof
c) Nusselt
d) Reynold

60. Sorghum is ground from the average particle size of 4 mm to 0.4 mm. Feed rate of the mill is 100 kg/h and power requirement is 5 KW. The Rittinger's constant of the sorghum will be
a) 0.022
b) 11.11
c) 13.88
d) 22.22

61. Ratio of diameter of the largest inscribing circle to the diameter of the smallest circumscribing circle is called
a) Roundness
b) Shape factor
c) Sphericity
d) None of the above

62. Total heat content or energy level of a material is called
a) Enthalpy
b) Entropy
c) Thermal conductivity
d) Heat transfer coefficient

63. A ton of refrigeration is equivalent to
a) 50 KCal/min
b) 100 KCal/min
c) 500 KCal/min
d) 1000 KCal/min

64. Equilibrium moisture curve is a plot between
a) Moisture content and relative humidity
b) Temperature and relative humidity
c) Moisture content and air temperature
d) Moisture content and air velocity

65. In convection drying of agricultural materials, rate of drying can be controlled by
a) Air temperature
b) Air velocity
c) Humidity
d) All of the above

66. A bin whose relative dimensions are such that the plane of rupture meets the grain surface before it strikes the opposite side is called
a) Pusa bin
b) Shallow bin
c) Vertical bin
d) Deep bin

67. The major forces acting on a cyclone separator are
a) Impact and frictional
b) Gravity and centrifugal
c) Frictional and centrifugal
d) Shear and impact

68. Suitable moisture content for safe storage of paddy is in the range of
a) 4-6%
b) 10-12%
c) 16-18%
d) 22-24%

69. The indented cylinder separators separates the materials on the basis of one of the following properties of material
a) Relative width
b) Relative thickness
c) Relative density
d) Relative length

70. Supercritical fluid extraction technique is suitable for extraction of
a) Essential oil
b) Protein
c) Carbohydrate
d) Germ oil

71. Cryogenics can be effectively used for
a) Rice milling
b) Oil milling
c) Spice milling
d) Pulse milling

72. LSU dryer is basically a
a) Co-current flow dryer
b) Counter current flow dryer
c) Cross flow batch dryer
d) Through flow batch dryer

73. Heat sterilization is generally suitable process for
a) Low acid food
b) High acid food
c) High protein food
d) High fat food

74. Airy's theory is applicable design of
a) Cleaners
b) Dryers
c) Screw conveyors
d) Silo

75. If bulk density of a material is given as 600 kg/m^3 and true density as 1000 kg/m^3, its porosity will be
a) 20%
b) 40%
c) 60%
d) 66.66%

76. The heat transfer area of a single effect evaporator is given as 2 m^2 and overall heat transfer coefficient as 2000 Jm^{-2}s^{-1}c^{-1}. The temperature difference across the evaporator is 50°C. The heat transfer (q, KJ/s) in the evaporator will be
a) 20
b) 200
c) 500
d) 2000

77. Psychrometric chart is a graphical representation of
a) Physical properties of air
b) Chemical properties of air
c) Thermodynamic properties of air
d) Physical properties of water vapour

78. Ball mills are generally used for
a) Coarse grinding of particles
b) Ultra fine grinding of particles
c) Medium to fine grinding of particles
d) Coarse to ultra fine grinding of particles

79. Fire bricks are used to
a) Reflect heat
b) Protect building against fire
c) Increase heat flow
d) Decrease heat flow

80. Solid foods are generally
a) Elastic
b) Viscoplastic
c) Viscoelastic
d) Plastic

81. Size reduction of grains is caused by impact in
a) Gyratory crushers
b) Crushing rolls
c) Hammer mill
d) Jaw crusher

82. Hermetically sealed containers are essential for
a) Vacuum and pressure packaging
b) Aseptic packaging
c) Flexible packaging
d) Controlled atmosphere packaging

83. For grain conveying through belt conveyors, the belt speed should be in the range of
a) 0.1 to 0.5 m/s
b) 2.5 to 2.8 m/s
c) 10.5 to 15.0 m/s
d) 20 to 25 m/s

84. The full form of HACCP in relation to food processing is
a) Hazard Analysis Central Control Point
b) Hazard Agricultural Commodity Control Point
c) Hazard Analysis Critical Control Point
d) Hazard Analysis for Critical Control of Products

85. The boiling point of milk is
a) 89.1°C
b) 99.1°C
c) 101°C
d) 100.17°C

86. D-value (decimal reduction time) depends upon
a) Temperature
b) Number of microorganisms initially present in the product
c) Heating time
d) Death rate constant

87. In modified atmosphere packaging
a) CO_2 and O_2 levels increase
b) CO_2 level increases and O_2 level decreases
c) CO_2 level decreases and O_2 level increases
d) CO_2 and O_2 levels remain constant

88. In which type of barn, the cows are housed and milked in the same building
a) Loose housing barn
b) Open air barn
c) Stanchion barn
d) None of the above

89. Wax coating on fruits and vegetables is done to
a) Retard respiration
b) Retard dehydration
c) Enhance appearance
d) All of the above

90. As the difference between dry bulb temperature and wet bulb temperature of air increases
a) Relative humidity increases
b) Relative humidity decreases
c) No change in relative humidity
d) Relative humidity approaches to zero

91. The evaporative cooling system is very much effective for storage of fruits and vegetables in the regions with
a) High temperature and high relative humidity
b) Low temperature and low relative humidity
c) Low temperature and high relative humidity
d) High temperature and low relative humidity

92. Central Institute of Post Harvest Engineering & Technology (CIPHET) is situated at
a) Bhopal
b) New Delhi
c) Ludhiana
d) Thanjaur

93. Wet milling of maize is performed to produce mainly
a) Flour
b) Semolina
c) Starch
d) Fine flour

94. The higher and lower temperature in a refrigerator working on reversed cycle are $30°C$ and $2°C$. The capacity of the machine is 35 KW. Its coefficient of performance (COP) will be
a) 9.82
b) 0.98
c) 0.48
d) 0.10

95. The process of dewaxing in oils is performed to remove
a) Wax
b) Organic impurities
c) Moisture
d) All of the above

96. Bio-gas contains mainly
a) Carbon monoxide
b) Ethylene
c) Nitrogen
d) Methane

97. A cylindrical silo of 3.0 m diameter and 20 m in height is filled with wheat. The hydraulic radius of the silo will be
a) 0.15 m
b) 0.75 m
c) 1.50 m
d) 60 m

98. Soxhlet apparatus is used for
a) Liquid solid extraction
b) Protein analysis
c) Carbohydrate analysis
d) Solid-gas extraction

99. The chemical used to control rodents in storage godowns is
a) Methyl bromide
b) Zinc phosphide
c) Phosphide
d) Ethyl bromide

100. The unit operation not included in the Agro-processing is
a) Drying and dehydration
b) Milling
c) Harvesting and threshing
d) Cleaning and grading

101. Protein and oil content in percentages of soybean are
a) 10 and 50
b) 20 and 40
c) 30 and 30
d) 40 and 20

102. Foods are frozen by direct immersion method at a temperature of
a) -18°C
b) -28°C
c) -45°C
d) -62°C

103. The most effective evaporator type is
a) Plate
b) Rising film
c) Falling film
d) Shell and tube

104. Most spoilage and pathogenic bacteria which contaminate food materials have water activity in the range of
a) 0.75-0.80
b) 0.81-0.85
c) 0.86-0.90
d) 0.91-0.99

105. A 5 kg block slides down a place inclined at 30°C to the horizontal. If $\mu=0.2$, its acceleration is
a) 0.98 m/s^2
b) 3.2 m/s^2
c) 4.9 m/s^2
d) 16 m/s^2

106. The part of a vapour compression refrigeration system, which absorbs heat from the refrigerated space is
a) Compressor
b) Evaporator
c) Condenser
d) None of the above

107. An equipotential line is the line of
a) Constant slope
b) Zero slope
c) Constant pressure
d) Zero pressure

108. The solvent used in oil extraction from rice bran is
a) Ethyl alcohol
b) Ammonia water
c) Methyl alcohol
d) Hexane

109. Rheology is the science of
a) Deformation in the metals
b) Stress and strain behaviour of metals
c) Deformation and flow in the visco-elastic materials
d) Flow of viscous products

110. Hydroclones are used for
a) Water measurement
b) Hydroelectric power generation
c) Separation of solids from liquids
d) Mixing of solids in water

111. Constituents of a mixture of water and soybean oil could be easily separated by
a) Filtration
b) Decantation
c) Evaporation
d) Fractionation

112. Which one of the following thermometers is the most sensitive?
a) Bimetallic
b) Resistance
c) Thermocouple
d) Thermistor

113. Percent oil content of rice bran from parboiled rice is about
a) 10-15
b) 15-20
c) 20-25
d) 25-30

114. Porosity is a property that
a) Changes as a result of change in colour and surface of the product
b) Changes as a result of change in shape and particle density
c) Changes as a result of change in angle of repose
d) Remains constant

115. Amongst the drying methods
a) Microwave drying results in highest shrinkage
b) Conventional air-drying develops lowest shrinkage
c) Freeze drying results in highest shrinkage
d) Conventional air-drying develops highest shrinkage

116. Parboiling is a hydrothermal process which is done for
a) Denaturation of protein
b) Removal of oil from rice bran
c) Gelatinization of starch
d) Drying of paddy

117. In wheat, endosperm material constitutes
a) 10% of the weight of kernel
b) 50 to 60 % of the weight
c) 70 to 80 % of the weight
d) Above 80% of the weight

118. Tofu is a product of
a) Rice
b) Wheat
c) Soybean
d) Chickpea

119. Osmotic dehydration is
a) Immersion of a produce in a diluted solution of brine or sugar
b) Immersion of a produce in a hypertonic solution
c) Immersion of a produce in water
d) Heating of a produce for dehydration

120. High carbon steels have carbon percentage in the range of
a) 0.1 - 0.4
b) 0.5 - 1.5
c) 2.0 - 3.0
d) More than 3.0

121. Post harvest losses in food grains are reported to be
a) 3%-7%
b) 8%-12%
c) 13%-17%
d) >18%

122. The material with oscillating screen is separated due to difference in
a) Size
b) Shape
c) Density
d) Surface properties

123. More suitable conveyor for transportation of sticky material is
a) Apron conveyor
b) Belt conveyor
c) Screw conveyor
d) Pneumatic conveyor

124. Which of the following temperature measuring devices will have least accuracy?
a) Clinical thermometer
b) Alcohol thermometer
c) Optical Pyrometer
d) Nitrogen filled thermometer

125. Ideal fluid is
a) Whose density is zero
b) Whose viscosity is zero
c) Whose conductivity is zero
d) Whose velocity is zero

126. In the concurrent/co-flow drying
a) Grain with minimum moisture content meets the air with highest drying potential
b) Grain with maximum moisture content meets the air with minimum drying potential
c) Grain with maximum moisture content meets the air with maximum drying potential
d) Grain moisture content does not play a role

127. Critical moisture content is the
a) Maximum moisture content that will sustain a rate of flow of free moisture to the surface of the grain
b) Minimum moisture content that will sustain a rate of flow of free moisture to the surface of the grain
c) Minimum moisture content that will accelerate the flow of free moisture
d) Maximum moisture content that will sustain accelerate the flow of free moisture

128. The extent of attrition of particles in the fluidized bed drying is
a) Proportional to cube of the air/gas velocity
b) Proportional to square of the air velocity
c) Equal to the air velocity
d) Inversely proportional to air velocity

129. The recommended airflow rate for aeration of grain in silos is
a) 0.05 – 0.25 m^3/min/tonne
b) 0.05 – 0.75 m^3/min/tonne
c) 0.5 – 0.75 m^3/min/tonne
d) 0.25 – 0.75 m^3/min/tonne

130. Ohmic heating is a process in which
a) Food liquids and solids are heated separately
b) Food liquids and solids are heated separately but cooled together
c) Food liquids and solids are heated simultaneously
d) Has no relevance to food processing

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) Wein's law   a) Heat conduction
ii) Newton's law   b) Relationship of wavelength and temperature
iii) Fourier's law   c) Cooling of substance
iv) Kirchhoff's law   d) Damage of fruits and vegetables
v) Hertz contact stress theory   e) Radiation

132.
i) Nusselt   a) Heat engine
ii) Einstein   b) Convection
iii) Stokes   c) Viscous flow
iv) Carnot   d) Photoelectricity
v) Clausius   e) Second law of thermo dynamics

133. Match the following laws with the related phenomena
i) MaxWell's law   a) Mass transfer
ii) Fick's law   b) Fluid flow
iii) Navier-Stokes' law   c) Size reduction
iv) Schrodinger's equation   d) Electro-magnetism
v) Bond's law   e) Uncertainty principle

134. Match the following materials with their most appropriate thermal conductivity values (W/mK)
i) Mercury   a) 0.556
ii) Gold   b) 0.024
iii) Diamond   c) 480
iv) Water   d) 8.21
v) Air   e) 2300

135.
i) Colour sorter   a) Temperature
ii) Relative humidity   b) Removal of rice bran
iii) Whitening   c) Bond's law
iv) Thermocouple   d) Optical properties
v) Milling of food grains   e) Sling psychrometer

136.
i) Size reduction   a) Majority of food spoilage
ii) High exit temperature   b) Storage of oilseeds at high moisture
iii) Microorganism   c) Low efficiency of drier
iv) Rancidity   d) Milling of grain by crushing
v) Aflatoxins   e) Development of FFA

137.
i) Cleaning   a) Moisture equalization
ii) Grading   b) Removal of moisture
iii) Drying   c) Removal of few large particles in the initial process
iv) Scalping   d) Classification of cleaned product into quality fraction
v) Tempering   e) Removal of foreign and undesirable matters

138.
i) Psychrometer   a) Size reduction device
ii) Cyclone separator   b) Grain size
iii) Indent grain separator   c) Electrostatic force
iv) Electrostatic separator   d) Relative humidity
v) Hammer mill   e) Centrifugal force

139.
i) Slump test   a) Calorific value of fuel
ii) Plate loading test   b) Consistency of concrete mix
iii) Rheometer test   c) Sensory evaluation
iv) Organolyptic test   d) Consistency of liquid food
v) Bomb-calorimeter test   e) Safe-bearing of soil

140.
i) Enthalpy   a) K
ii) Entropy   b) J/Kg
iii) Absolute temperature   c) J/K
iv) Specific heat   d) m^2/s
v) Thermal diffusivity   e) J/Kg K

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. How knowledge of frictional properties is useful in design of agricultural processing equipment and storage structures?

142. Discuss briefly design of a screw conveyer for granular materials.

143. Discuss briefly static method for determination of Equilibrium Moisture Content (EMC).

144. Differentiate between controlled atmosphere packaging (CAP) and modified atmospheric packaging (MAP) for fruits and vegetables.

145. Discuss briefly the freeze drying technique.

146. The threshed wheat grain contains mustard/rapeseed as impurities. Suggest techniques to separate it from the wheat grain. Also, describe the principle of cleaning device suitable for this purpose.