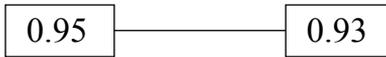


103. Which of the following is NOT a primary purpose of statistical process control?
- (A) to establish control limits
 - (B) to detect special cause variations
 - (C) to identify specification limits
 - (D) to determine when a process is not in control
104. If a sample of 40 units of output found 500 defects, then the 3-sigma upper control limit for the \bar{c} chart would be
- (A) 12.5
 - (B) 23.11
 - (C) 37.5
 - (D) 75.0
105. The probability of rejecting a lot that has an acceptable quality level is referred to as the
- (A) producer's risk
 - (B) consumer's risk.
 - (C) lot tolerance percent defective
 - (D) acceptable quality level.
106. A(n) _____ curve is a graph showing the probability of accepting a lot for different quality levels with a specific sampling plan.
- (A) operating characteristic (OC)
 - (B) average outgoing quality
 - (C) lot tolerance percent defective
 - (D) single-sample attribute
107. The expected number of defective items that will pass on to the customer with a sampling plan is known as the
- (A) lot tolerance percent defective.
 - (B) acceptable quality level.
 - (C) average outgoing quality.
 - (D) sampling plan.
108. All of the following can improve a product's reliability except
- (A) simplifying product design
 - (B) improving individual component reliability
 - (C) changing the product warranty
 - (D) adding redundant components
109. A structured process that translates the voice of the customer into technical design requirements is known as
- (A) quality function deployment (QFD)
 - (B) failure mode and effects analysis (FMEA)
 - (C) concurrent design
 - (D) robust product design

110. A company produces a product consisting of two components arranged as follows:



If both components must function for the product to function, then the product's overall reliability is

- (A) 0.950 (B) 0.940
 (C) 0.930 (D) 0.884
111. Which of the following will not improve design for manufacture and assembly?
- (A) Minimizing the number of parts and subassemblies.
 (B) using standard parts when possible
 (C) designing parts for limited, unique uses
 (D) designing parts for many, varied uses
112. The number of arrivals per unit of time at a service facility can frequently be described by a
- (A) normal distribution. (B) Poisson distribution.
 (C) binomial distribution. (D) beta distribution.
113. Consider an espresso stand with a single server. Customers arrive to the stand at the rate of 28 per hour according to a Poisson distribution. Service times are exponentially distributed with a service rate of 35 customers per hour. The probability that there are more than 2 customers in the system is
- (A) 0.128 (B) 0.488
 (C) 0.512 (D) 0.640
114. A company is evaluating which of two alternatives should be used to produce a product that will sell for \$35.00 per unit. The following cost information describes the two alternatives

	Process A	Process B
Fixed Cost	Rs.500,000	Rs. 750,000
Variable Cost per Unit	Rs. 25.00	Rs. 23.00

If total demand (volume) is 120,000 units, then the company should

- (A) select Process A with a profit of Rs. 940,000 to maximize profit
 (B) select Process B with a profit of Rs. 450,000 to maximize profit
 (C) select Process A with a profit of Rs. 700,000 to maximize profit
 (D) select Process B with a profit of Rs. 690,000 to maximize profit

115. Steel, paper, paints, and chemicals are examples of products that use
 (A) batch production (B) repetitive production.
 (C) continuous production (D) ma production.
116. Which of the following describes a Process layout?
 (A) equipment is general purpose and the workers are unskilled
 (B) equipment is specialized and the workers are highly skilled
 (C) equipment is general purpose and the workers are highly skilled
 (D) equipment is specialized and the workers are unskilled
117. Two techniques used to design process layouts are
 (A) block diagramming and assembly line balancing.
 (B) relationship diagramming and assembling line balancing.
 (C) relationship diagramming and assembly line balancing.
 (D) block diagramming and relationship diagramming.
118. An assembly line consists of three workstations (WS) with each station's activity time as shown.
- ```

graph LR
 WS1[WS 1 (5 min)] --> WS2[WS 2 (3 min)]
 WS2 --> WS3[WS 3 (4 min)]

```
- The cycle time for this line is  
 (A) 5 minutes (B) 3 minutes  
 (C) 4 minutes (D) 12 minutes
119. Which of the following statements is most true?  
 (A) product layouts are flexible; process layouts are efficient  
 (B) product layouts are efficient: process layouts are flexible  
 (C) product and process layouts are equally flexible; neither are efficient  
 (D) product and process layout are equally efficient: neither are flexible
120. One of the best known computerized packages available for designing process layouts is CRAFT. CRAFT stands for  
 (A) computerized relationship activity and flow technique.  
 (B) computerized relative allocation of facilities technique.  
 (C) computerized relative assembly and flow technology.  
 (D) computerized relationship assembly flow time.

121. A company is deciding where to locate a new warehouse that will receive shipments from three suppliers: 1, 2, and 3. The locations of the suppliers  $(x_1, y_1)$  and the annual number of shipments from supplier  $i$  ( $W_i$ ) are provided below:

|             |             |             |
|-------------|-------------|-------------|
| 1           | 2           | 3           |
| $x_1 = 250$ | $x_2 = 100$ | $x_3 = 500$ |
| $y_1 = 250$ | $y_2 = 400$ | $y_3 = 300$ |
| $W_1 = 240$ | $W_2 = 205$ | $W_3 = 300$ |

The coordinates for the new warehouse suggested by the center of gravity method are

- (A)  $x = 311.4$  and  $y = 309.4$                       (B)  $x = 309.4$  and  $y = 311.4$   
 (C)  $x = 291.2$  and  $y = 198.9$                       (D)  $x = 193.2$  and  $y = 219.4$
122. Motion study, the study of the individual human motions used in a task, was developed by  
 (A) Henry Ford                                              (B) F. W. Taylor  
 (C) Frank and Lillian Gilbreth                      (D) Frederick Herzberg
123. A 90% learning curve indicates  
 (A) a 90% increase in processing time per unit as output doubles.  
 (B) a 90% decrease in processing time per unit as output doubles.  
 (C) a 10% increase in processing time per unit as output doubles.  
 (D) a 10% decrease in processing time per unit as output doubles.
124. As part of its quality-improvement program a company is conducting a time study for a particular job. The time study encompassed 10 job cycles, and the results include the following cumulative times and performance rating factors for each element.

| Element | t (min) | RF   |
|---------|---------|------|
| 1       | 3.33    | 1.10 |
| 2       | 4.5     | 1.00 |
| 3       | 2.85    | 1.05 |
| 4       | 5.05    | 1.10 |
| 5       | 1.53    | 0.90 |

The standard time for this job using an allowance factor of 16% is:

- (A) 1.809 minutes                                      (B) 2.098 minutes  
 (C) 1.530 minutes                                      (D) 2.233 minutes

125. How many cycles should be used in a time study in order to be 95% confident that the time-study average job cycle time is within 5% of the true average job cycle time. Assume that the average job cycle time was 2.67 minutes and the standard deviation of the sample was 0.72 minutes.

- (A) 36 cycles (B) 72 cycles  
(C) 98 cycles (D) 112 cycles

126. The estimated mean time for an activity with a most likely time (m) equal to 11 days, the optimistic time (a) equal to 6 days, and the pessimistic time (b) equal to 18 days is

- (A) 9.67 days (B) 11 days  
(C) 11.33 days (D) 11.67 days.

127. A project consists of the following four activities with activity times in days:

| Activity | Predecessor | Time |
|----------|-------------|------|
| A        |             | 6    |
| B        | A           | 5    |
| C        | A           | 4    |
| D        | B,C         | 8    |

Using Table, the earliest finish (EF) time for activity C is

- (A) 4 days (B) 6 days  
(C) 10 days (D) 11 days

128. Which of the following statements is generally true regarding the relationship between project crashing costs and indirect costs?

- (A) both crashing costs and indirect costs are highest when the project is shortened  
(B) only indirect costs increase when the project is shortened  
(C) both are unaffected by the length of the project  
(D) crashing costs increase when the project is shortened while indirect costs decrease when the project is shortened

129. One way to reduce the bullwhip effect is for supply chain members to

- (A) make ordering decisions independently of each other.  
(B) create demand forecasts independently of other supply chain members.  
(C) share demand forecasts with other supply chain members.  
(D) restrict information flows between supply chain members.

130. A company that produces small electric motors for treadmills had cost of goods sold last year of Rs. 241,000,000. The average value of inventory for raw materials, work-in-process, and finished goods are shown in the table below:

|                 |                |
|-----------------|----------------|
| Raw Materials   | Rs. 12,379,000 |
| Work-In-Process | Rs. 7,631,000  |
| Finished Goods  | Rs. 9,275,000  |

If the company operates 365 days a year the days of supply being held in inventory is

- (A) 44.35 (B) 27.39  
(C) 8.23 (D) 1215
131. The fraction of orders filled by a distribution center or warehouse within a specific time period is referred to as the  
(A) inventory turnover (B) inventory supply time  
(C) fill rate (D) aggregate orders proceed
132. A qualitative procedure used to develop a consensus forecast is known as  
(A) exponential smoothing (B) regression methods.  
(C) the Delphi technique (D) naive forecasting.
133. An exponential smoothing forecasting technique requires all of the following except  
(A) the forecast for the current period.  
(B) the actual demand for the current period.  
(C) a smoothing constant.  
(D) large amounts of historical demand data.
134. A company wants to product a weighted moving average forecast for April with the weights 0.40, 0.35, and 0.25 assigned to March, February, and January, respectively. If the company had demands of 5,000 in January, 4,750 in February, and 5,200 in March, then April's forecast is  
(A) 4983.33 (B) 4992.50  
(C) 4962.50 (D) 5000.00
135. A tracking signal is computed by  
(A) multiplying the cumulative error by MAD  
(B) multiplying the absolute error by MAD  
(C) dividing MAD by the cumulative absolute error  
(D) dividing the cumulative error by MAD

136. In general, as the order size increases  
(A) ordering costs decrease and carrying costs increase.  
(B) ordering costs increase and carrying costs decrease.  
(C) both ordering and carrying costs increase.  
(D) both ordering and carrying costs decrease.
137. A service level of 95% means there is a 0.95 probability  
(A) of meeting all demand  
(B) of a stockout.  
(C) that supply will exceed demand.  
(D) that demand will be met during the lead time.
138. A product's usage is normally distributed with a weekly average demand of 2,000 units and a weekly standard deviation of 125. The product's lead time is 4 weeks. Currently, the reorder point for this product is 8,200. If the company would like to have a service level of 95% for this product then  
(A) it must decrease its safety stock by approximately 412 units.  
(B) it must decrease its safety stock by approximately 212 units.  
(C) it must increase its safety stock by approximately 412 units.  
(D) it must increase its safety stock by approximately 212 units.
139. Inventory management includes all the following activities except determining  
(A) the amount of inventory to keep in stock.  
(B) customer demand .  
(C) how much to order.  
(D) when to order.
140. A continuous inventory system is also known as a  
(A) fixed-time period system  
(B) fixed-order quantity system  
(C) fixed-lead time system  
(D) fixed-amount system
141. The economic order quantity is most widely used for determining how much to order in  
(A) periodic inventory system      (B) continuous inventory system  
(C) an on-demand inventory system      (D) none of the above
142. Adjusting available capacity by hiring and firing workers to match demand is an example of a(n) \_\_\_\_\_ strategy.  
(A) level production      (B) chase demand  
(C) mixed production      (D) optimal production

143. The following information relates to a company's aggregate production planning activities:

| Quarter | Demand Forecast |
|---------|-----------------|
| 1       | 75,000          |
| 2       | 100,000         |
| 3       | 75,000          |
| 4       | 125,000         |

Beginning Workforce = 35 workers

Production per Employee = 1.250 units per quarter

Hiring Cost = Rs. 500 per worker

Firing Cost = Rs. 1,000 per worker

Inventory Carrying Cost = Rs. 20 per unit per quarter

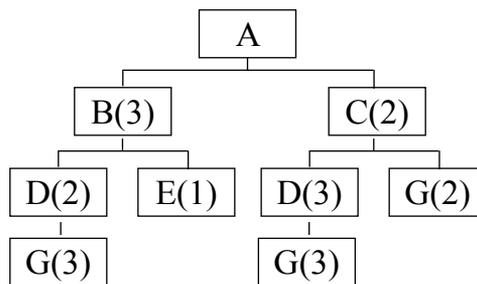
If a level production strategy is used then the required quarterly output is

- (A) 75,000 (B) 87,350  
 (C) 93,750 (D) 125,000
144. A company is developing a linear programming model for its aggregate production plan. If  $I_t$  = units in inventory at the end of period  $t$ ,  $P_t$  = units produced in period  $t$ , and  $D_t$  = demand in period  $t$ , then the company's demand constraint to ensure that demand is met in quarter 3 is
- (A)  $D_3 = I_2 - I_3 + P_3$  (B)  $D_3 = I_3 + P_3$   
 (C)  $D_3 = I_3 - I_2 + P_3$  (D)  $D_3 = I_2 - I_3 + P_2$
145. Given the information below, the number of available-to-promise units in period 4 is

|                            | Period |     |     |     |     |     |
|----------------------------|--------|-----|-----|-----|-----|-----|
| On Hand = 200              | 1      | 2   | 3   | 4   | 5   | 6   |
| Forecast                   | 300    | 250 | 300 | 300 | 200 | 200 |
| Customer Orders            | 250    | 200 | 250 | 200 | 150 | 250 |
| Master Production Schedule | 500    |     |     | 700 |     |     |
| Available-to-Promise       |        |     |     |     |     |     |

- (A) 500 (B) 100  
 (C) 200 (D) 350
146. The optimal solution for a linear programming problem will always occur
- (A) when the slack price equals the surplus price.  
 (B) when the surplus price equals the slack price.  
 (C) at an extreme point.  
 (D) at a non-extreme point.

147. For a less than or equal to ( $\leq$ ) constraint the shadow price represents the  
 (A) amount you would be willing to pay for one additional unit of a resource.  
 (B) amount at which you would be willing to sell one additional unit of a resource.  
 (C) difference between the slack price and the surplus price.  
 (D) difference between the surplus price and the slack price.
148. Material requirements planning (MRP) is useful for all of the following except  
 (A) dependent demand items (B) discrete demand items.  
 (C) independent demand items (D) erratic orders.
149. All of the following are inputs into the MRP process except  
 (A) the master production schedule (B) the product structure file  
 (C) the item master file (D) the planned order report.
150. A phantom bill of material is used  
 (A) to group small, loose parts together.  
 (B) when the product is manufactured in major subassemblies.  
 (C) for subassemblies that are immediately consumed in the next stage of production.  
 (D) when due dates have not been calculated.
151. The MRP process of subtracting on-hand quantities and scheduled receipts from gross requirements to produce net requirements is referred to as  
 (A) cycle counting. (B) lot sizing.  
 (C) exploding (D) netting
152. Given the following Product Structure Record



- The number of G's required for each A would be  
 (A) 40 (B) 20  
 (C) 18 (D) 3

153. Given the following MRP matrix for Item D:

| ITEM: D<br>Lot Size: Min 100<br>LT: 2 | Period |     |     |     |     |     |     |
|---------------------------------------|--------|-----|-----|-----|-----|-----|-----|
|                                       | 1      | 2   | 3   | 4   | 5   | 6   | 7   |
| Gross Requirements                    | 60     | 90  | 150 | 150 | 180 | 270 | 120 |
| Schedule Receipts                     |        | 150 |     |     |     |     |     |
| Project on Hand<br>120                |        |     |     |     |     |     |     |
| Net Requirements                      |        |     |     |     |     |     |     |
| Planned Order<br>Receipts             |        |     |     |     |     |     |     |
| Planned Order<br>Releases             |        |     |     |     |     |     |     |

The planned order release for period 3 would be

- (A) 100 (B) 160  
(C) 270 (D) 300

154. The instrument used for the measurement of pressure is

- (A) Bellows (B) Diaphragms  
(C) Fiber optic pressure sensors (D) All of these

155. The range of values of  $p$  and  $q$  which will render the payoff element  $a_{22}$  as saddle point for the game whose payoff matrix  $(a_{ij})$  is given below:

|          | Player |   | B |
|----------|--------|---|---|
| Player A | 2      | 4 | 5 |
|          | 10     | 7 | q |
|          | 4      | P | 6 |

- (A)  $p >= 7$  and  $q < 7$  (B)  $p <= 7$  and  $q > 7$   
(C)  $p > 7$  and  $q <= 7$  (D)  $p < 7$  and  $q >= 7$

156. The test statistic used to test if there is a significant difference between the sample mean  $\bar{x}$  and population mean  $\mu$  for small values of  $n$  ( $< 30$ ) is:

- (A) Z-test (B) t-test  
(C) F-test (D) None of the above

157. Accepting null hypotheses is when it is false or when alternative hypothesis is true is called:

- (A) Type I error (B) Type II error  
(C) Type III error (D) None of the above

158. The distribution in which mean, median and mode coincide is

- (A) Exponential distribution (B) Normal distribution  
(C) Poisson distribution (D) Binomial distribution

159. One ton of refrigeration is equal to \_\_\_\_\_  
(A) 120B Th U/hr (B) 200 B Th U/hr  
(C) 1200B Th U/hr (D) 12000 B Th U/hr
160. According to Kelvin-Planck statement, it is impossible to construct a device operating on a cycle which transfers heat from:  
(A) low pressure heat reservoir to high pressure reservoir  
(B) low temperature heat reservoir to high temperature reservoir  
(C) high pressure heat reservoir to low pressure reservoir  
(D) high temperature heat reservoir to low temperature reservoir
161. The radiation pyrometers work on the principle of \_\_\_\_\_  
(A) Newton's law (B) Stefan Boltzmann's law  
(C) Zeroth law (D) None of the above
162. What are the number of sliding and turning pairs in a slider crank mechanism?  
(A) 1 sliding pair and 3 turning pairs  
(B) 2 sliding pairs and 2 turning pairs  
(C) 3 sliding pairs and 1 turning pair  
(D) None of the above
163. Factor of safety is the ratio of \_\_\_\_\_  
(A) working stress and ultimate strength  
(B) yield strength and endurance strength  
(C) ultimate strength and yield strength  
(D) yield strength and working stress
164. The component deforming progressively under load at high temperatures is called as  
(A) Resilience (B) Creep  
(C) Fatigue (D) All of the above
165. If in the minimum ratio rule of simplex method, the minimum ratio is equal for two rows, then the next basic solution will be :  
(A) Non-degenerate (B) Degenerate  
(C) Un-bound (D) alternate optima
166. In Lincoln plan (one type of group incentive plan), the amount of the profit which an employee receives in addition to the guaranteed basic pay/wages, is based on:  
(A) A standard rating system (B) A merit rating system  
(C) A job evaluation system (D) His individual performance

167. For a small scale industry, the fixed cost per month is Rs. 5000. The variable cost per product is Rs. 20 and sales price is Rs. 30 per piece. The break even production per month will be  
 (A) 300 (B) 460  
 (C) 500 (D) 1000
168. If (R) is the base rate guaranteed per hour, (S) is the standard time for the job and (T) is the actual time, then according to Halsey 50-50 plan, wages for the job will be  
 (A) TR (B)  $TR + [(S - T)/2] \times R$   
 (C)  $TR + (S - T) \times R$  (D)  $TR + [(S - T)/S] \times R$
169. Who is called as the 'founding father of modern economies'?  
 (A) Adam Smith (B) John Maynard Keynes  
 (C) F. Hayek (D) Samuelson
170. Which of the following projection methods does not use projectors perpendicular to the projection plane?  
 (A) isometric (B) orthographic  
 (C) oblique (D) axonometric
171. Sensible heat is  
 (A) the heat which causes change of state  
 (B) the heat which does not allow temperature to rise  
 (C) the heat which brings about change in temperature  
 (D) all of the above
172. The specific heat at constant pressure is \_\_\_\_\_ that of specific heat at constant volume.  
 (A) equal to (B) less than  
 (C) more than (D) none of the above
173. If petrol is used in a diesel engine, then  
 (A) low power will be produced (B) efficiency will be low  
 (C) higher knocking will occur (D) black smoke will be produced
174. The intercooling in multi-stage compressors is done  
 (A) to cool the air during compression  
 (B) to cool the air at delivery  
 (C) to enable compression in two stages  
 (D) to minimise the work of compression
175. Maximum flame temperature in case of gas welding occurs at  
 (A) at the tip of the fame (B) at the tip of the torch  
 (C) inner cone (D) next to the inner cone

176. Preheating before welding is done to  
 (A) make steel softer  
 (B) burn away oil, grease etc. from work surface  
 (C) prevent cold cracks  
 (D) prevent workpiece deformation
177. Which of the following pair is not correctly matched?  
 (A) Aluminium alloy                      Pressure die casting  
 (B) Jewellery                                Lost wax process  
 (C) Large pipes                              Centrifugal casting  
 (D) Large bells                                Loam moulding
178. For obtaining a cup of diameter 25 mm and height 15 mm by drawing, the size of the round blank should be approximately  
 (A) 42 mm                                      (B) 44 mm  
 (C) 46 mm                                      (D) 48 mm
179. Which is not a characteristic property of ceramic material?  
 (A) high temperature stability  
 (B) high mechanical strength  
 (C) low elongation  
 (D) low hardness
180. Crater wear starts at some distance from the tool tip because  
 (A) Cutting fluid cannot penetrate that region  
 (B) stress on rake face is maximum at the region  
 (C) tool strength is minimum at that region  
 (D) tool temperature is maximum at that region
181. Back rack angle  
 (A) Appears at the second position of tool signature  
 (B) Appears at the start of tool signature  
 (C) Appears at the middle of tool signature  
 (D) Appears at the end of tool signature
182. During the execution of CNC part program block  
 NO20 G02 X45.0 Y25.0 R5.0 the type of tool motion will be  
 (A) Circular interpolation- clockwise  
 (B) Circular interpolation- counterclockwise  
 (C) Linear interpolation  
 (D) rapid feed
183. A metric Vernier caliper is having 25 divisions on Vernier scale. These 25 divisions match with 24 divisions of main scale. If one main scale division = 0.5 mm, the least count of the Vernier caliper is  
 (A) 0.02 mm                                      (B) 0.01 mm  
 (C) 0.005 mm                                      (D) 0.001 mm

184. Tachometers are used for measurement of  
(A) Displacement (B) angular velocity  
(C) vibration (D) time
185. In which stage of Product life cycle the brand choice is heavily influenced by reference group  
(A) Introduction (B) Growth  
(C) Maturity (D) Decline
186. Today the concepts of \_\_\_\_\_ manufacturing stress the need to supply customers with what they want when they want it and to keep inventories at a \_\_\_\_\_.  
(A) TQM, maximum (B) Six Sigma, maximum  
(C) JIT, minimum (D) ISO 9000, minimum
187. Product cost can be reduced by considering the following aspect(s) at the design stage  
(A) Minimum number of operations  
(B) Unnecessary tight tolerance should not be provided  
(C) Design should consist of standard parts  
(D) All of the above
188. The correct sequence of operations in production planning and control is  
(A) Routing-Scheduling-Dispatching-Follow up  
(B) Scheduling-Routing- Dispatching-Follow up  
(C) Dispatching-Routing-Scheduling- Follow up  
(D) Routing-Scheduling-Follow up-Dispatching
189. Loading may be defined as  
(A) Sending the raw material to the machine  
(B) Sending the finished material to the store  
(C) Assign the work to the facilities  
(D) Uploading a software in machine control panel
190. The bill of material does not consists of  
(A) Part number (B) Specifications of part  
(C) Name of the part (D) Price of the part
191. Gantt chart is mostly used for  
(A) Routing (B) Scheduling  
(C) Follow up (D) Inspection and quality control
192. The following are the principles in the application of Anthropometric data except  
(A) Design for extreme individuals (B) Design for the average  
(C) Design for adjustable range (D) Design for the optimum

193. A cutting tool has a nose radius of 1.8 mm. the feed rate for a theoretical surface roughness of  $R_n = 5\mu\text{m}$  is  
(A) 0.36 mm/rev (B) 0.187 mm/rev  
(C) 0.036 mm/rev (D) 0.0187 mm/rev
194. In a weaving operation, the parameter to be controlled is the number of defects per 10 square yards of the material. Control chart appropriate for this task is  
(A) p-chart (B) c-chart  
(C) r-chart (D) x bar-chart
195. The thrust force will increase with increase in  
(A) side cutting edge angle (B) tool nose radius  
(C) rake angle (D) end cutting edge angle
196. Production scheduling is simpler, and high volume of output and high labour efficiency are achieved in the case of  
(A) fixed position layout  
(B) process layout  
(C) product layout  
(D) a combination of line and process layout
197. The individual human variability in time studies to determine the production standards is taken care of by  
(A) personal allowances (B) work allowances  
(C) rating factor (D) none of the above
198. An air preheater  
(A) increases evaporative capacity of the boiler  
(B) increases the efficiency of the boiler  
(C) enables low grade fuel to be burnt  
(D) all of the above
199. The refrigerant, commonly used in vapour absorption refrigeration system, is  
(A) sulphur dioxide (B) ammonia  
(C) freon (D) aqua-ammonia
200. A ratchet screw is provided on a micrometer screw gauge to  
(A) lock the measured reading  
(B) maintain constant measuring pressure for all readings  
(C) prevent wearing of screw threads  
(D) allow zero adjustments