SECTION - A
Multiple Choice Questions
Answer all questions of this Section.
30 marks

01. Select from (1), (2), (3) and (4) the most correct answer to each of the following questions. Write the number of the selected answer in your answer booklet with the English letter assigned to the question.

(A) The Least Common Multiple (LCM) of 8, 9, 12 and 16 is:
   (1) 16  (2) 144  (3) 12  (4) 4

(B) Factors of \( 7x^2 y^2 - 7 \) are:
   (1) \((7xy -1)(xy -7)\)  (2) \((7xy +1)(xy -1)\)
   (3) \(7(xy -1)\)  (4) \((7xy -1)(y +1)\)

(C) A few models made by a child by using match sticks are shown below:

1st Model  2nd Model  3rd Model

The number of match sticks required to make the 7th model is:
   (1) 18  (2) 20  (3) 22  (4) 28
(D) Annual profit of **ALBA Ltd.** for the last year amounted to Rs.150 million. The Board of Directors of the company has decided to pay dividends equivalent to 30% of the profit to the shareholders. 60% of the shares of the company are held by **Anoma, Lanka & Bandu** in the ratio of 3:5:2 respectively.

The dividend to be received by **Lanka** from **ALBA Ltd.** is:

(1) Rs.13.5 million.  
(2) Rs.45 million.  
(3) Rs.5.4 million  
(4) Rs.8.1 million.

(E) If \( A = \begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix} \), inverse of the matrix A is given by:

(1) \( \begin{pmatrix} -\frac{5}{2} & \frac{3}{2} \\ 2 & -1 \end{pmatrix} \)  
(2) \( \begin{pmatrix} \frac{5}{2} & \frac{3}{2} \\ -2 & 1 \end{pmatrix} \)  
(3) \( \begin{pmatrix} 1 & -2 \\ -\frac{3}{2} & \frac{5}{2} \end{pmatrix} \)  
(4) \( \begin{pmatrix} \frac{3}{2} & \frac{5}{2} \\ \frac{3}{2} & \frac{5}{2} \end{pmatrix} \)

(F) A person has borrowed Rs.120,000/- at an interest rate of 8% compounded annually. Total amount of money that should be repaid by him after 2 years is:

(1) Rs.129,600/-.  
(2) Rs.139,968/-.  
(3) Rs.101,568/-.  
(4) Rs.110,400/-. 

(G) A school management team comprises of 2 Principals and 6 Teachers. A sub-committee needs to be formed by having a Principal and 3 Teachers.

The number of different ways in which the sub-committee could be selected is:

(1) 22  
(2) 122  
(3) 40  
(4) 240

(H) The marginal cost function of a cement manufacturer is, \( MC = 7 + 10q - 9q^2 \).

(Where \( q \) is the number of cement bags in millions)

The fixed cost of the factory is Rs.10 million. The total cost of manufacturing 1 million cement bags is:

(1) Rs.15 million.  
(2) Rs.70 million.  
(3) Rs.21 million.  
(4) Rs.19 million.
(I) The following graph shows the quadratic function $y = x^2 + x - 2$.

Using the above graph, approximate values for “$x$” in the equation of “$x^2+x-4=0$” are:

(1) -3, 2  (2) 0, 2  (3) -2.5, 1.5  (4) 0, -2

(J) A box contains 4 red balls and 2 blue balls. A ball is drawn at random and then replaced. A second ball is then drawn at random. The probability of getting at least one blue ball is:

(1) $\frac{5}{9}$  (2) $\frac{2}{4}$  (3) $\frac{2}{6}$  (4) $\frac{4}{6}$

(K) Which one of the following sampling methods is not a probabilistic sampling method?

(1) Random sampling.  (2) Quota sampling.  
(3) Cluster sampling.  (4) Systematic sampling.

(L) The value of the consumer basket in 1990 was Rs.7,000/- and it is Rs.22,000/- in 2014. The price relative in 2014 assuming 1990 as the base year is:

(1) 22  (2) 14  (3) 3  (4) 314

(M) A construction company’s quarterly profit distribution for the past 50 quarters is as follows:

<table>
<thead>
<tr>
<th>Quarterly Profit (Rs. million)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 - 10</td>
<td>8</td>
</tr>
<tr>
<td>11 - 20</td>
<td>14</td>
</tr>
<tr>
<td>21 - 30</td>
<td>12</td>
</tr>
<tr>
<td>31 - 40</td>
<td>9</td>
</tr>
<tr>
<td>41 - 50</td>
<td>7</td>
</tr>
</tbody>
</table>

The 01$^{st}$ quartile ($Q_1$) of the data set is (Rs. Million):

(1) 14  (2) 13.7  (3) 8.8  (4) 7.5
(N) The Cumulative Frequency Curve / ogive (low) below represents the ages of 24 people who need to be relocated due to a proposed project. The company pays compensation based on the age of the person relocated, and the highest amount is paid to the person with the median age.

The age of the person who will receive the highest compensation is (years):

(1) 24   (2) 15   (3) 40   (4) 34

(O) The segmental profit of an airline industry is as follows:

<table>
<thead>
<tr>
<th>Segmental Profit</th>
<th>USD (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Line - Tickets</td>
<td>80</td>
</tr>
<tr>
<td>Catering</td>
<td>160</td>
</tr>
<tr>
<td>Value Added Services</td>
<td>70</td>
</tr>
<tr>
<td>Others</td>
<td>50</td>
</tr>
</tbody>
</table>

The correct pie-chart which represents the above segmental profit is:

(1)  (2)  (3)  (4)

(02 marks each, Total 30 marks)
02. (a) (i) The length of a rectangular block of land exceeds its width by 4 meters. The area of the block is $480 \text{m}^2$.

Find the length and the width of the land.

(ii) Find the value of $x$:

$$\log_5 x^3 + \log_5 27 + 2 \log_5 4 - \log_5 25 - \log_5 16 - \frac{3}{2} \log_5 9 = 1$$

(07 marks)

(b) Write the expansion of $(2x - 5)^5$ using binomial theorem. (04 marks)

(c) (i) Mr. and Mrs. Perera wish to have an annuity for their daughter when she goes to university. They wish to invest in an annuity at the rate of 8% per annum that will pay their daughter Rs.1,000/- per month for 4 years. What is the present value of the annuity?

(ii) An asset with a cost of Rs.6.25 million is depreciated on the straight-line method basis at 2.5% per annum at cost. Calculate the carrying value (book value) of the asset after 13 years. (06 marks)

(d) The fixed cost of a service provider is Rs.2,100/- and the variable cost per hour of providing service is Rs.12/-. The services income is Rs.15/- per hour in a given quarter.

(i) Find the total cost, if the service provider works 8 hours per day for 90 days.

(ii) Draw the cost function and revenue function on a graph paper and find the breakeven number of hours to be worked for the service using the graph.

(Note: select the number of hours ranging from 100 to 900 hours) (08 marks)

(e) A manufacturing company’s variable cost is Rs.6/- per unit and the total fixed cost is Rs.560/-. The total revenue function is given below:

$$\text{TR} = -2x^2 + 31x + 520$$

where $x$ is the number of units produced.

(i) Find the Profit Function.

(ii) Calculate the maximum profit using differentiation. (05 marks)

(Total 30 marks)
03. (a) The following data provides the statistics on the annual maintenance cost and the useful life of machinery in a production line of a factory.

<table>
<thead>
<tr>
<th>Useful life (in years)</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual maintenance cost (Rs.'000)</td>
<td>5</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>18</td>
<td>21</td>
<td>26</td>
<td>32</td>
</tr>
</tbody>
</table>

Using the information given above:
(i) Plot the data on a scatter diagram.
(ii) Calculate the Pierson’s correlation coefficient and comment on the relationship between the two variables.

You may use the following formula,
\[ r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}} \] (10 marks)

(b) Briefly explain “independent events” in probability with an example. (03 marks)

(c) The staff in an organization is divided into three categories as follows:

<table>
<thead>
<tr>
<th>Female(F)</th>
<th>Male (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative Staff (A)</td>
<td>20</td>
</tr>
<tr>
<td>Executive Staff (E)</td>
<td>60</td>
</tr>
<tr>
<td>Sales Staff (S)</td>
<td>100</td>
</tr>
</tbody>
</table>

If a staff member is selected randomly,
(i) Find the probability that staff member is a female.
(ii) Find the probability that the staff member is an administrative staff member given that he is a male staff member.
(iii) Find the probability that the staff member is a female, given that she is a sales staff member. (07 marks)

04. (a) As per the Central Bank statistics, the average lending rate of banks in December 2014 is 9%. It has been forecast that the average lending rate will continue to decline from January 2015 to April 2015 at a rate of 10% every month (90% of its previous month’s value). From May 2015, it will decline at a rate of the 20% every month. What will be the average lending rate in August 2015? (04 marks)

(b) The executive committee of an insurance company decided to test basic mathematical skills of their staff members. The following grouped data distribution relates to the marks obtained by 40 staff members who have sat for the said exam:

<table>
<thead>
<tr>
<th>Marks</th>
<th>45-50</th>
<th>51-56</th>
<th>57-62</th>
<th>63-68</th>
<th>69-74</th>
<th>75-80</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Staff members</td>
<td>4</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Using the above data, draw a histogram on a graph paper and find the mode value of the distribution using the histogram. (06 marks)

(Total 10 marks)
05. (a) **MG City** is considering purchasing a spray painting machine. The cost of the machine is Rs.225,000/- . Cash inflow is Rs.100,000/- per annum for the next 5 years. The new machine will have a useful life of 5 years. The operating & maintenance expense for the first year is Rs.20,000/- and this will increase by 20% each year. The required rate of return of the **MG City** is 10% per annum. Using the above data, you are required to:

(i) Calculate the Net Present Value of the investment.

(ii) State whether MG City management should invest in this new machine.

You may use the following discounting factors at 10%.

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.909</td>
<td>0.826</td>
<td>0.751</td>
<td>0.683</td>
<td>0.621</td>
<td>0.564</td>
</tr>
</tbody>
</table>

(b) The following table shows the prices and quantities of 3 items A, B and C for the years 2012 and 2013:

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th></th>
<th>2013</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>P_o</td>
<td>q_o</td>
<td>P_n</td>
<td>Q_n</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>5</td>
<td>200</td>
<td>5</td>
<td>300</td>
</tr>
<tr>
<td>B</td>
<td>15</td>
<td>450</td>
<td>12</td>
<td>200</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>540</td>
<td>6</td>
<td>600</td>
</tr>
</tbody>
</table>

Considering 2012 as the base year, calculate the Laspeyres’ Price Index for the year 2013.

06. (a) The following information relates to the details of the types of bank accounts maintained by the workers of a factory:

- 100 workers of the factory maintain bank accounts.
- All savings account holders have fixed deposit accounts.
- No workers have both current accounts and savings accounts.
- 30 workers have only current accounts.
- 40 workers have current accounts.
- 70 workers have fixed deposit accounts.
- 40 workers have savings account.

How many workers have fixed deposit accounts only?

(Note: you may use Venn diagram or any other suitable method)

(b) **DDG Bank’s** head office branch has granted 88 loans during the month of December. The loan amounts in Rs. million and the number of loans granted are given in the following table:

<table>
<thead>
<tr>
<th>Loan Amount (Rs. million)</th>
<th>No. of Loans Granted</th>
</tr>
</thead>
<tbody>
<tr>
<td>00 ≤ x &lt; 10</td>
<td>06</td>
</tr>
<tr>
<td>10 ≤ x &lt; 20</td>
<td>16</td>
</tr>
<tr>
<td>20 ≤ x &lt; 30</td>
<td>24</td>
</tr>
<tr>
<td>30 ≤ x &lt; 40</td>
<td>25</td>
</tr>
<tr>
<td>40 ≤ x &lt; 50</td>
<td>17</td>
</tr>
</tbody>
</table>

Using the above data, Compute,

(i) Mean,

(ii) Standard Deviation,

on the loan amount.