



K.L.E. SOCIETY'S
P. C. JABIN SCIENCE COLLEGE
HUBBALLI
AUTONOMOUS

Semester I

B.Sc.

B.C.A.

M.Sc.

Answer Booklet No.

40039

Theory Semester End Examination
April/May 2021-22
Nov./Dec. 20

Certified that the entries made by the candidate are found to be correct.

Deshai 18/3/22

Signature of the Room Supervisor with Date

Exam. Reg. No.

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Class : B.Sc-I Subject : Statistics Subject Code No. 120DSC01T-I-22

Paper : Descriptive Statistics

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IMPORTANT INSTRUCTIONS TO CANDIDATES

- 1) On the cover page of answer book compulsorily mention your Register Number, Subject, Course Code and required information.
- 2) Don't write your name or mark any signs, such answer scripts shall not be assessed and punished.
- 3) Write your answer from 1st page and don't leave any blank pages and blank space in between.
- 4) Last page is meant for rough work and on completion put cross mark (x)
- 5) The candidates are informed strictly to write their answer only with black ink & write on both sides of the answers sheets.

IMPORTANT INSTRUCTIONS TO CANDIDATES

- 6) Please mention the Question number in the margin. Answer's without Question number & also with wrong question number shall not be valued.
- 7) The students are informed to take compulsorily the signature of the room supervisor with date on the answer book.
- 8) The candidate should be present 20 minutes before the commencement of the examination. After that no students will be allowed in the examination hall.
- 9) Use of any electronic gadgets in the examination hall is strictly prohibited.
- 10) After the last warning bell, no candidate is allowed to leave his/her seat.
- 11) Indulging in different ways and using different means that lead to malpractice is prohibited.
- 12) Don't fold the answers sheets & keep the answer sheets clean.

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ಉತ್ತರವನ್ನು ಇಲ್ಲಿಂದ ಆರಂಭಿಸಿ
START WRITING ANSWER FROM HERE BELOW

Unit - IV

7) a) Ans The interdependency of three variables, while keeping a variable constant and finding it by the joint effect of other two variables.

7) c) solⁿ Here $r_{12.3} = \frac{\text{cov}(X_{1.3}, X_{2.3})}{\sqrt{V(X_{1.3}) V(X_{2.3})}} \rightarrow \textcircled{1}$

$$\text{cov}(X_{1.3}, X_{2.3}) = \frac{1}{N} \sum X_{1.3} X_{2.3}$$

$$= \frac{1}{N} \sum [(X_1 - b_{13} X_3) (X_2 - b_{23} X_3)]$$

$$= \frac{1}{N} \sum X_1 X_2 - \frac{b_{23}}{N} \sum X_1 X_3 - \frac{b_{13}}{N} \sum X_2 X_3 + \frac{b_{13} b_{23}}{N} \sum X_3^2$$

$$= r_{12} \frac{\sigma_1 \sigma_2}{\sigma_3} - r_{23} \frac{\sigma_2}{\sigma_3} r_{13} \frac{\sigma_1 \sigma_3}{\sigma_3} - r_{13} \frac{\sigma_1}{\sigma_3} r_{23} \frac{\sigma_2 \sigma_3}{\sigma_3}$$

$$+ r_{13} \frac{\sigma_1}{\sigma_3} r_{23} \frac{\sigma_2}{\sigma_3} \sigma_3$$

$$= r_{12} \frac{\sigma_1 \sigma_2}{\sigma_3} - r_{23} r_{13} \frac{\sigma_1 \sigma_2}{\sigma_3} - r_{13} r_{23} \frac{\sigma_1 \sigma_2}{\sigma_3}$$

$$+ r_{13} r_{23} \frac{\sigma_1 \sigma_2}{\sigma_3}$$

$$\text{cov}(X_{1.3}, X_{2.3}) = \frac{\sigma_1 \sigma_2}{\sigma_3} (r_{12} - r_{13} r_{23}) \rightarrow \textcircled{2}$$

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$$V(X_{1.3}) = \frac{1}{N} \sum X_{1.3}^2$$

$$= \frac{1}{N} \sum X_{1.3} X_{1.3}$$

$$= \frac{1}{N} \sum X_{1.3} X_{1.3} \quad (\because \text{Property : 2})$$

$$= \frac{1}{N} \sum (X_{1.3} - b_{13} X_{3.3})$$

$$= \frac{1}{N} \sum X_{1.3}^2 - b_{13} \sum X_{1.3} X_{3.3}$$

$$= \sigma_1^2 - r_{13} \frac{\sigma_1 \sigma_3}{r_{13}}$$

$$= \sigma_1^2 - r_{13}^2 \sigma_1^2$$

$$V(X_{1.3}) = \sigma_1^2 (1 - r_{13}^2) \rightarrow (3)$$

$$\text{Similarly } V(X_{2.3}) = \sigma_2^2 (1 - r_{23}^2) \rightarrow (4)$$

Substitute eq^s (2), (3) and (4) in eqⁿ (1)

On substituting, we get

$$r_{12.3} = \frac{\sigma_1 \sigma_2 (r_{12} - r_{13} r_{23})}{\sqrt{\sigma_1^2 (1 - r_{13}^2)} \sqrt{\sigma_2^2 (1 - r_{23}^2)}}$$

$$\therefore r_{12.3} = \frac{r_{12} - r_{13} r_{23}}{\sqrt{(1 - r_{13}^2)(1 - r_{23}^2)}}$$

Hence the proof

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Unit - III

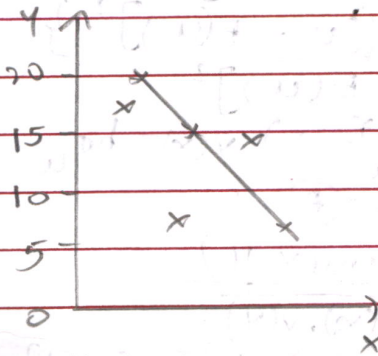
6) a) Ans

$$x - \bar{x} = b_{xy} (y - \bar{y})$$

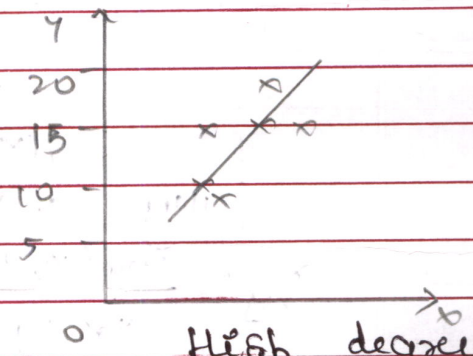
$$y - \bar{y} = b_{yx} (x - \bar{x})$$

6) b) Ans

The most easy and common method of studying the correlation is the scatter diagram method. Here by the help of diagrams we predict the results. The main objective is that even a non-statistician can tell the interpretation. As it is pictorial representation, it helps to draw out the results easily. This method comes first when we speak about correlation. As the name indicates the points are scattered and the regression lines are drawn to show the reliability of the two lines. We can conclude whether it is perfect correlation, high degree or low degree. To illustrate it further we can have two examples:



High degree +ve correlation



High degree negative correlation

6) c) & 1) Statement :- The correlation coefficient is independent of change of origin and scale

Proof :- Consider $u = \frac{x-a}{h}$, $v = \frac{y-b}{k}$

We can write them as

$$\left. \begin{aligned} x &= a + hu \\ y &= b + kv \end{aligned} \right\} \rightarrow (1)$$

Taking expectations, we get

$$\left. \begin{aligned} E(x) &= a + hE(u) \\ E(y) &= b + kE(v) \end{aligned} \right\} \rightarrow (2)$$

On subtracting eqⁿ (1) from eqⁿ (2) we have

$$x - E(x) = hu - hE(u)$$

$$y - E(y) = kv - kE(v)$$

$$\left. \begin{aligned} x - E(x) &= h(u - E(u)) \\ y - E(y) &= k(v - E(v)) \end{aligned} \right\} \rightarrow (3)$$

$$\begin{aligned} \text{Consider } v(x) &= \sigma_x^2 = E[(x - E(x))]^2 \\ &= E[h(u - E(u))]^2 \\ &= E[h^2(u - E(u))^2] \\ &= h^2 E[(u - E(u))^2] \end{aligned}$$

$$v(x) = h^2 \sigma_u^2 \Rightarrow v(x) = h^2 \sigma_u^2 \rightarrow (A)$$

$$\text{Similarly } v(y) = k^2 \sigma_v^2 \rightarrow (B)$$

$$r_{xy} = \frac{\text{cov}(x, y)}{\sigma_x \sigma_y} = \frac{\text{cov}(x, y)}{\sqrt{v(x) \cdot v(y)}}$$

$$r_{xy} = \frac{E[(x - E(x)) \cdot (y - E(y))]}{\sqrt{v(x) \cdot v(y)}}$$

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$$r_{xy} = \frac{E\{h(u - E(u))\} E\{k(v - E(v))\}}{\sqrt{h^2 \sigma_u^2 k^2 \sigma_v^2}}$$

$$r_{xy} = \frac{hk E\{(u - E(u))(v - E(v))\}}{hk \sigma_u \sigma_v}$$

$$r_{xy} = \frac{\text{cov}(u, v)}{\sigma_u \sigma_v} = r_{uv}$$

$$r_{xy} = r_{uv}$$

Hence the proof.

Unit - II

3) a) Any Harmonic mean is reciprocal of arithmetic mean reciprocal of the set of values.

$$\text{i.e. } H.M. = \frac{n}{\sum \left(\frac{1}{x}\right)}$$

3) b) Solⁿ Property : 1

Algebraic sum of the deviations of the values taken from their mean is zero

Proof - Let x_i and f_i 's be the distribution with $i = 1(1)n$

$$\begin{aligned} \sum f(x_i - \bar{x}) &= 0 \\ \text{LHS} &= \sum f x_i - \sum f \bar{x} \\ &= N \bar{x} - N \bar{x} \\ &= 0 \end{aligned}$$

$$\therefore \text{LHS} = \text{RHS}$$

Property : 2 (Minimal property of mean)

Algebraic mean of square of sum of deviation of taken from their mean is minimum.

Proof :- Let x_i and f_i be the distribution where $i = 1(1)n$

By the statement,

$$z = \sum f_i (x_i - A)^2 \iff$$

where A is any arbitrary point, we need to first prove that $A = \bar{x}$

By minima and maxima of differential calculus,

$$\frac{dz}{dA} = 0$$

$$\frac{d^2z}{dA^2} > 0$$

$$\frac{dz}{dA} = \sum f_i x_i - \sum f_i A$$

$$\sum f_i x_i - \sum f_i A = 0$$

$$A = \frac{\sum f_i x_i}{\sum f_i}$$

$$A = \bar{x}$$

$$\frac{d^2z}{dA^2} = \sum f_i (1)$$

$$\frac{d^2z}{dA^2} = \sum f_i > 0$$

Property : 3

Composite series \oplus combined mean

If n_1 and \bar{x}_1 is the size and mean of series A and n_2 and \bar{x}_2 is the size and mean series B, then combined mean is given by

$$\bar{x}_c = \frac{n_1 \bar{x}_1 + n_2 \bar{x}_2}{n_1 + n_2}$$

Let $x_{11}, x_{12}, \dots, x_{1n_1}$ be the series of n_1 observations

$$\bar{x}_1 = \frac{x_{11} + x_{12} + \dots + x_{1n_1}}{n_1 + n_2 + \dots + n_k} = \frac{\sum_{i=1}^{n_1} n_i x_{1i}}{n_1}$$

$$\Rightarrow \bar{x}_1 n_1 = \sum_{i=1}^{n_1} n_i x_{1i} \rightarrow (1)$$

Again let $x_{21}, x_{22}, \dots, x_{2n_2}$ be the series of n_2 observations

$$\bar{x}_2 = \frac{x_{21} + x_{22} + \dots + x_{2n_2}}{n_2} = \frac{\sum_{i=1}^{n_2} n_i x_{2i}}{n_2}$$

$$\Rightarrow \bar{x}_2 n_2 = \sum_{i=1}^{n_2} n_i x_{2i} \rightarrow (2)$$

Let $x_{k1}, x_{k2}, \dots, x_{kn_k}$ be the series of n_k observations

$$\bar{x}_k = \frac{x_{k1} + x_{k2} + \dots + x_{kn_k}}{n_k} = \frac{\sum_{i=1}^{n_k} n_i x_{ki}}{n_k}$$

$$\Rightarrow \bar{x}_k n_k = \sum_{i=1}^{n_k} n_i x_{ki} \rightarrow (3)$$

On combining,

$$\bar{x} = \frac{(x_{11} + x_{12} + \dots + x_{1n_1}) + (x_{21} + x_{22} + \dots + x_{2n_2}) + \dots + (x_{k1} + x_{k2} + \dots + x_{kn_k})}{n_1 + n_2 + \dots + n_k}$$

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$$\bar{x}_c = \frac{n_1 \bar{x}_1 + n_2 \bar{x}_2 + \dots + n_k \bar{x}_k}{n_1 + n_2 + \dots + n_k} \quad (\text{By } \textcircled{1}, \textcircled{2} \text{ and } \textcircled{3})$$

3) c) Ans: Geometric mean refers to the n^{th} root of product of n values in the series
i.e, $G.M = \sqrt[n]{x_1 \cdot x_2 \cdot \dots \cdot x_n}$

Uses:-

- Geometric mean is used in index numbers
- It is used to find solutions in problems related to time, work and speed
- It is used in the calculation of growth of area

Merits:-

- * $G.M$ is based on all the observations
- * It is well defined by a mathematical formula
- * It can be used for further mathematical treatment

Demerits:-

- * It is affected by abnormal extreme values
- * If there is negative value then geometric mean is imaginary and if zero occurs in the given values, then geometric mean cannot be computed.

Unit - I

1) Ans Statistics is defined as the science of collection, presentation, analysis and interpretation of numerical data.

1) Ans Sampling is the process of extraction of sample from the universe. There are four types of sampling.

- i) Simple random sampling
- ii) Systematic random sampling
- iii) Stratified random sampling
- iv) Cluster sampling

i) Simple random sampling

As the name suggests, in this method every individual has the chance of being selected. Simply a sample is selected and the process goes on.

ii) Systematic random sampling

In case of systematic random sampling, the data is arranged serial wise like alphabetically, or in some other pattern and if randomly a unit is chosen then other members of that group are selected accordingly.

iii) Stratified random sampling.

This method is applied when the data is heterogeneous. Sub-groups of the population called strata are made which divide the population homogeneously and then from that stratum the samples are choosed.

iv) Cluster sampling

This is as same as stratified random sampling. The only exception is, here sub-groups of the population clusters are made and they are only the samples. We won't choose the sample again.

1)c) Any Primary data is the data which is directly collected by the investigator from the field of enquiry. It is also called first hand data. There are five methods for the collection of primary data.

① Direct personal observation.

Here, the investigator approaches the informants and collect the data himself. It is out of bias. It depends on the situation that how the data is to be collected. But it's time consuming and needs money and labour too. It is like Census enumeration where everything is included.

(ii) Indirect oral Interview

When the person who is the informant is not ready to give the information, then this method can be adopted. Here the people who are related to the problem of investigation or who are aware of that are interrogated. But the persons may colour the information. It is also lengthy process.

(iii) Information through agencies

In this method the agents or correspondents are appointed and they pass the information at regular basis. Usually this method is adopted by newspapers and media. It is economical and the data acquired is updated one.

(iv) Mailed questionnaires

This method is useful when the respondents are literate. A questionnaire with some questions is mailed to the informants with a covering letter requesting them to answer the questions and return the duly filled form within the prescribed time. But this method fails if the mob is illiterate and in the case of non response follow up work is essential.

(v) Schedules sent through enumerators

Here, enumerators are trained and given a schedule which is to be filled by them when

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they interrogate the informants. This method needs more time, money and the training of the enumerators is essential. This is better than mailed questionnaires.

Hence, by using these mentioned methods, primary data are collected by different sources.

Secondary data is already collected and analyzed data. It is also called as second hand data. There are two sources of secondary data - Published sources and Unpublished sources.

- The data available in newspapers, magazines, periodicals, journals, etc.
- The information in the websites of the search engine.
- The information by central and state government.
- The official and unofficial agencies like MOSPI (Ministry of Statistics and Program Implementation), RGI (Registrar General of India), IIPS (Indian Institute of Population Studies), NSO (National Statistical Organization), ISI (Indian Statistical Institute).
- The researches of scholars in research centres.
- The conspired rumours of spy agencies.

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2) a) Ans

Inclusive C.I

* The upper limit of a class is included from certain class interval and included as lower limit in the next class interval

* Correction factor is necessary for conversion

* 1-9, 10-19, 20-29, ...

Exclusive C.I

* Both upper limit and lower limit is included in the same class interval

* No need of correction factor

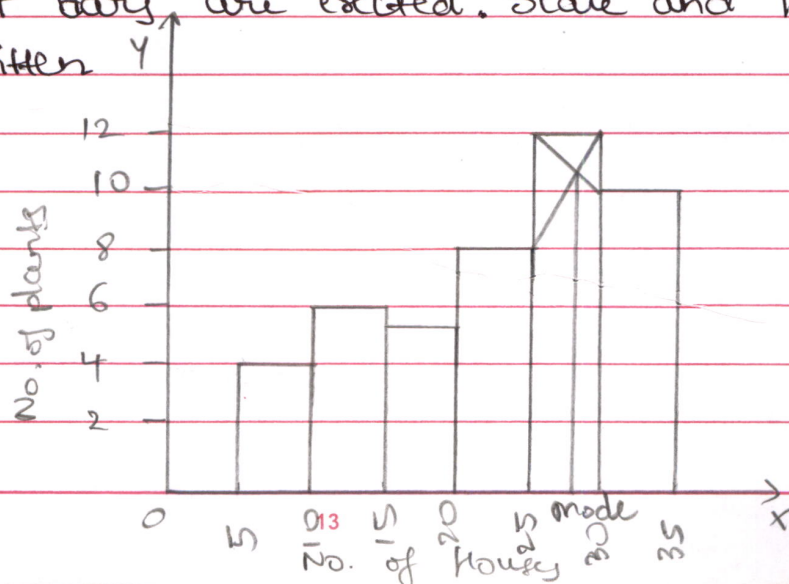
* 10-20, 20-30, 30-40, ...

2) b) Ans

Histogram :- By histogram mode can be found.

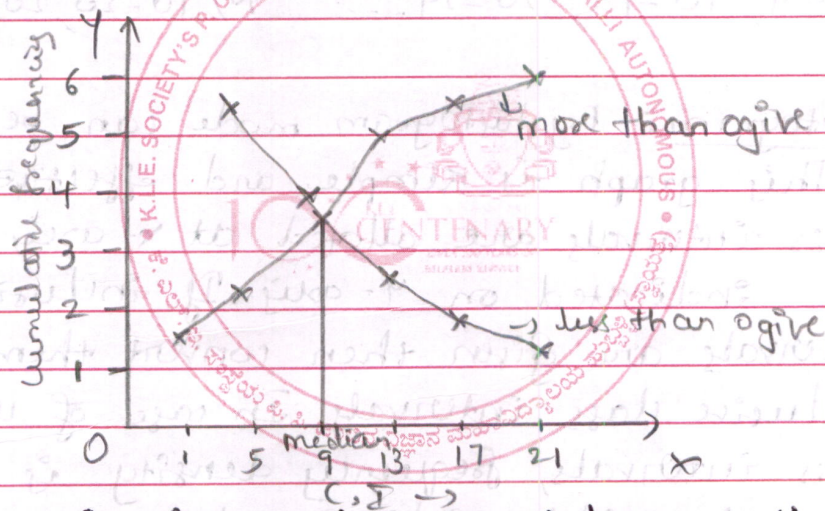
This graph is simple and effective where class intervals are plotted at x-axis and frequency are indicated on y-axis. If inclusive class intervals are given then convert them into exclusive class intervals. In case of unequal class intervals, frequency density is used.

Here the width indicates class size and the length gives the frequency. Rectangular adjacent bars are erected. Scale and key note are written



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Ogives: These are also known as cumulative frequency curves. We can denote partition values by using ogive. Generally median is found less than and more than cumulative frequencies are computed. By using upper limits and by a rising smooth curve is drawn. By the help of lower limits and by a declining smooth curve is drawn. At the point of intersection of two curves median is located.



Cumulative frequencies are taken on the y-axis. Class intervals are written on the x-axis.

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- 2) c) i) Ans) A questionnaire should be attractive
- ★) It should contain as much as less number of questions
 - ★) Yes/No type questions are preferable
 - ★) Mathematical signs should be avoided
 - ★) Necessary instructions should be mentioned
 - ★) Personal questions are not necessary to include

2) c) ii) Ans

Table no:-

Title
(Sub-title)

Stubs (Row heading)	Captions (column heading)	
	sub heading	sub heading
Row entries	Body of the table	

Foot note)-

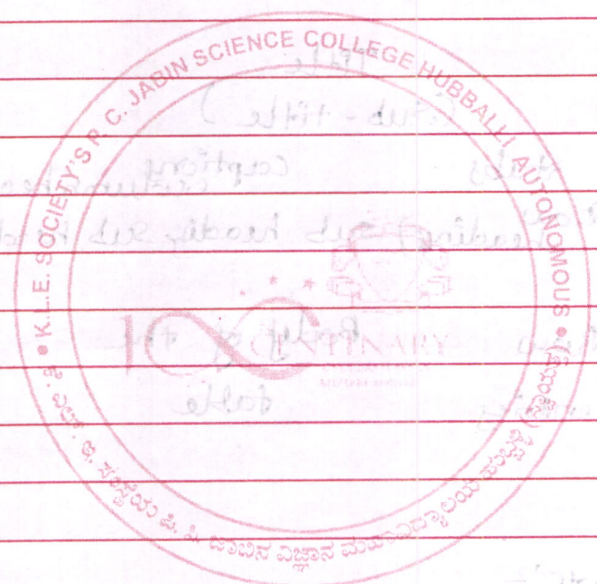
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1. The structure of blood is as follows: (4 marks)
The blood is a fluid connective tissue. It is composed of plasma and cells. The cells are red blood cells, white blood cells and platelets.

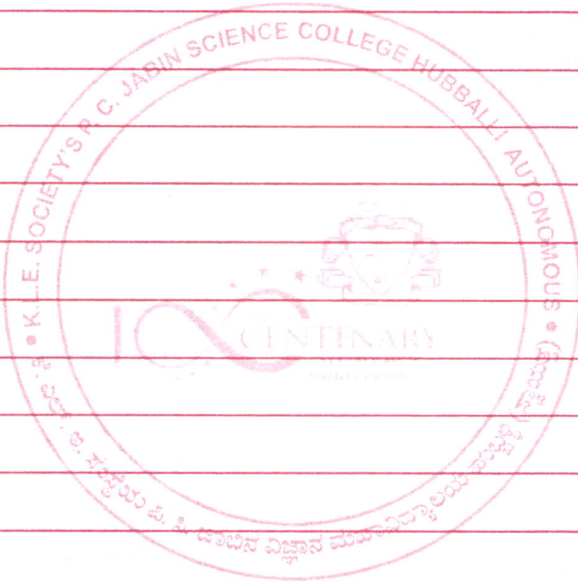
2. The function of blood is as follows: (4 marks)
The function of blood is to transport oxygen and nutrients to the cells and to carry away carbon dioxide and waste products. It also helps in maintaining the body temperature and pH.

3. The structure of blood vessel is as follows: (4 marks)

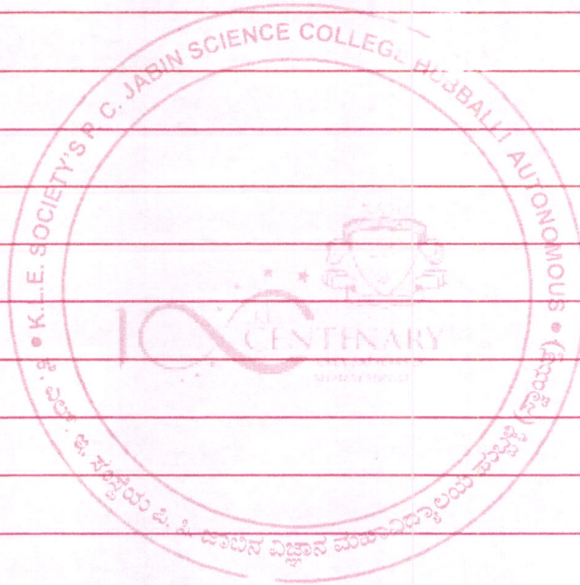


4. The structure of blood vessel is as follows: (4 marks)

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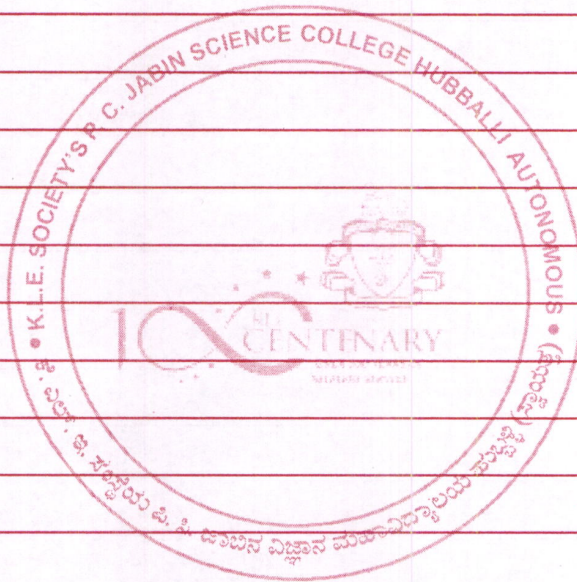
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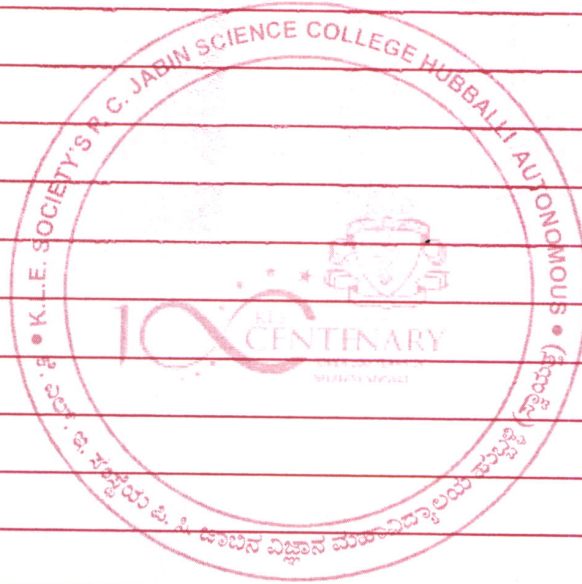
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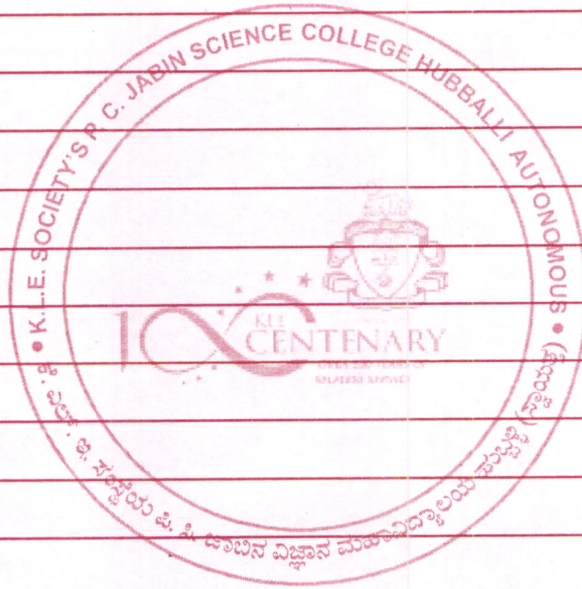
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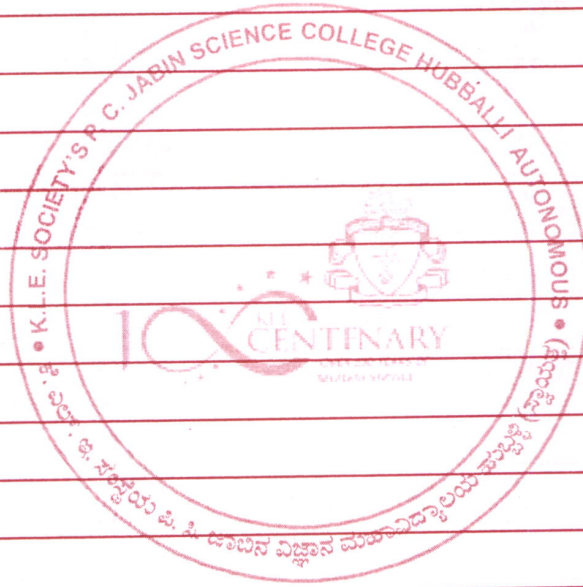
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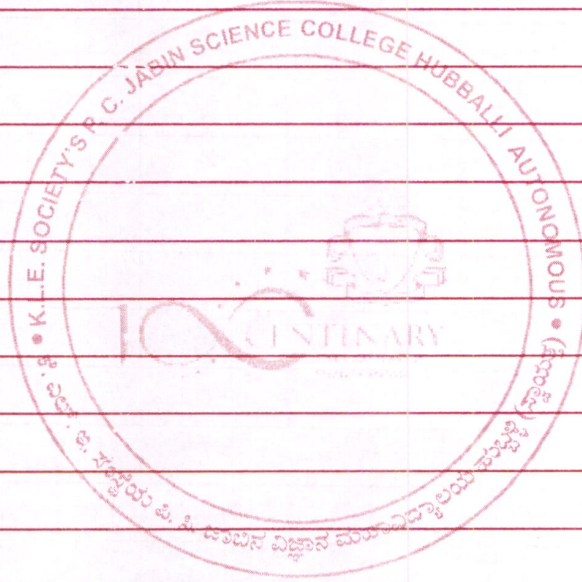
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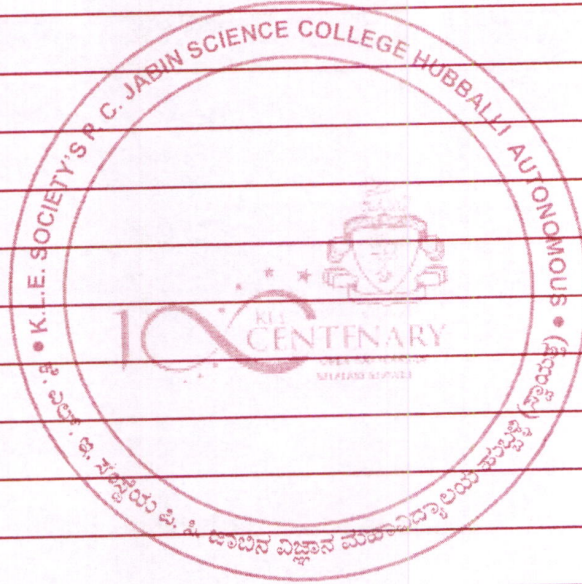
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