

APRIL - 2001

[KD 705]

Sub. Code : 4165

FIRST B.Pharmacy DEGREE EXAMINATION.

(Revised Regulations)

Paper V — MATHEMATICS INCLUDING
BIOSTATISTICS

Time : Three hours Maximum : 75 marks

Answer Sections A and B in the same answer book.

SECTION A — (6 × 5 = 30 marks)

(MATHEMATICS)

Answer any SIX questions.

1. Express $\frac{x+4}{(x^2-4)(x+1)}$ in partial fractions.

2. Find the sum to infinity of the series

$$1 + \frac{3}{2^2} + \frac{5}{3^2} + \frac{7}{4^2} + \dots \infty.$$

3. Show that the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$ satisfies

the equation $A^3 - 23A - 40I = 0$ where I is the third order unit matrix.

4. Define the following :

- (a) Subsets
- (b) Union of sets
- (c) Intersection of sets.

5. Simplify :

$$\frac{(\cos 3\theta + i \sin 3\theta)^5 (\cos \theta - i \sin \theta)^3}{(\cos 5\theta + i \sin 5\theta)^7 (\cos 2\theta - i \sin 2\theta)^5}$$

6. Expand $\cos^6 \theta$ in a series of cosines of multiples of θ .

7. Differentiate $\sin^{-1} \left(\frac{2x}{1+x^2} \right)$ with respect to $\cos^{-1} \left(\frac{1-x^2}{1+x^2} \right)$.

8. Solve : $\frac{dy}{dx} = \frac{x+y+1}{2x+2y+1}$.

9. Solve : $x \frac{dy}{dx} + y = x^3 y^6$.

SECTION B — (3 × 15 = 45 marks)

(BIOSTATISTICS)

Answer any THREE questions.

10. (a) Explain the following :

- (i) Uses of Statistics in the field of pharmacy.
- (ii) Graphic representation of a frequency distribution.

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(b) Calculate the Mean and Standard Deviation for the following data relating to the concentration of antibody in blood serum taken from 50 donors.

Antibody in Blood Serum (g/l)	3.95-5.95	5.95-7.95	7.95-9.95	9.95-11.95
Donors (f)	1	3	7	11
Antibody in Blood Serum (g/l)	11.95-13.95	13.95-15.95	15.95-17.95	17.95-19.95
Donors (f)	9	12	8	1

11. (a) Calculate the Mean Deviation from Mean for the data found in question 10. (b) Also calculate the Mean Deviation from median

(b) Calculate the combined Mean and Standard deviation from the following data :

Group	Number	Mean	Standard Deviation
A	50	56	3
B	60	60	4
C	90	58	5

12. (a) Calculate the coefficient of correlation between x and y from the following data

x :	78	89	97	69	59	79	68	57
y :	125	137	156	112	107	138	123	108

(b) The following regression equations were obtained from a correlation table :

$$y = 0.516x + 33.73$$

$$x = 0.512y + 32.52$$

Find the value of (i) the correlation coefficient (ii) the means of the variables.

13. (a) Explain the following :

- (i) Mutually exclusive events.
- (ii) Independent events.
- (iii) Conditional probability.

(b) Find the probability of drawing two yellow tablets in succession from a bottle containing 4 yellow and 5 red tablets when the tablet that is drawn first is (i) replaced (ii) not replaced.

14. (a) Explain the following :

- (i) Errors in sampling.
- (ii) Critical region.
- (iii) Various types of sampling.

(b) In a factory there are two independent processes manufacturing the same item. The average weight in a sample of 250 items produced from one process is found to be 120 gms. with a standard deviation of 12 gms. while the corresponding figures in a sample of 400 items from the other process are 124 and 14. Obtain the standard error of difference between the two sample means. Is this difference significant? Also find the 99% confidence limits for the difference in the average weights of items produced by the two processes respectively.

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FIRST B.Pharm. DEGREE EXAMINATION.

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Paper V — MATHEMATICS INCLUDING
BIostatISTICS

Time : Three hours

Maximum : 75 marks

Answer Sections A and B in same answer books.

SECTION A — (6 × 5 = 30 marks)

(MATHEMATICS)

Answer any SIX questions.

1. Resolve into partial fraction $\frac{x+1}{x(x+2)(x-1)}$.
2. Sum to infinity $1 - \frac{3}{5} + \frac{9}{25} - \frac{27}{125} + \dots$.
3. If $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & 1 \\ -2 & 0 & 2 \end{bmatrix}$ find A^2 and transpose of A .

4. If $A = \begin{bmatrix} 3 & 5 & 2 \\ 4 & 7 & 6 \end{bmatrix}$, $B = \begin{bmatrix} -1 & 2 & 5 \\ 4 & 0 & 3 \end{bmatrix}$ and

$C = \begin{bmatrix} 0 & 3 & 4 \\ 9 & 8 & -7 \end{bmatrix}$ find $5A - 4B + 3C$.

5. Simplify $\left[\frac{\sin \pi/8 + i \cos \pi/8}{\sin \pi/8 + i \cos \pi/8} \right]^8$.

6. Find the modulus and amplitude of $\sqrt{2} \left[\cos \left(\frac{5\pi}{3} \right) + i \sin \left(\frac{5\pi}{3} \right) \right]$ and express it in Cartesian form.

7. (a) If $y^x = x^y$ find $\frac{dy}{dx}$.

(b) If $y = \cos(x^{\log x})$ find $\frac{dy}{dx}$. $(2\frac{1}{2} + 2\frac{1}{2})$

8. Evaluate

(a) $\int \sin(5x) \cos(3x) dx$

(b) $\int x \log x dx$. $(2\frac{1}{2} + 2\frac{1}{2})$

9. Solve: $\frac{dx}{dy} + \frac{x}{1+y^2} = \frac{\tan^{-1} y}{1+y^2}$.

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SECTION B — (3 × 15 = 45 marks)

(BIOSTATISTICS)

10. (a) Write with the help suitable example distinction between

- (i) Continuous series and discrete series.
- (ii) Exclusive and inclusive class intervals. (5 + 5)

(b) Explain the terms :

- (i) Range
- (ii) Class limits
- (iii) Class intervals
- (iv) Frequency with suitable example. (5)

11. (a) Draw Histogram and Frequency polygon for the given distribution : (7)

Marks (x) :	0-10	10-20	20-30	30-40	40-50
No. of students (f) :	8	20	36	15	6

(b) Compute the mode of the given distribution : (8)

Size of item :	4-8	8-12	12-16	16-20	20-24
Frequency :	10	12	16	14	10

Size of item :	24-28	28-32	32-36	36-40
Frequency :	8	17	5	4

12. (a) Calculate standard deviation from the following data : (7)

Size of item (x) :	5	10	15	20	25	30	35
Frequency (f) :	2	7	11	15	10	4	1

(b) Calculate the coefficient of correlation for the following age of husbands and wives : (8)

Husbands age :	23	27	28	29	30	31	33	35	36	39
Wives age :	18	22	23	24	25	26	28	29	30	32

13. (a) Define the terms with example :

- (i) Trial
- (ii) Event
- (iii) Sample space
- (iv) Mutually exclusive event
- (v) Independent event. (10)

(b) Explain the terms null hypothesis and alternative hypothesis with example. (5)

14. (a) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find mean and standard deviation. (7½)

(b) The income of a group of 10000 persons were found to be normally distributed with mean = Rs. 750 per month with a standard deviation = Rs. 50. Show that of this group 95% had income exceeding Rs. 668 and only 5% had income exceeding Rs. 832. What was the lowest income among the richest 100? (7½)

[KG 705]

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FIRST B.Pharm. DEGREE EXAMINATION.

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MATHEMATICS AND BIOSTATISTICS

Time : Three hours Maximum : 75 marks

Answer Section A and Section B in separate Answer Books.

SECTION A — (6 × 5 = 30 marks)

Answer any SIX questions.

(MATHEMATICS)

1. Resolve into partial fractions :

$$\frac{2x^2 + 10x - 3}{(x + 1)(x - 3)(x + 3)} \quad (5)$$

2. Prove that

$$\frac{1}{1!} + \frac{1+3}{2!} + \frac{1+3+5}{3!} + \dots \text{ to infinity} = 2e. \quad (5)$$

3. If $A = \begin{bmatrix} 1 & 2 \\ 2 & 4 \\ 5 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 5 \\ 2 & 4 & 6 \end{bmatrix}$, prove that

$$(AB)' = B' A'. \quad (5)$$

4. If $A = \{0, 1\}$, $B = \{1, 2\}$ and $C = \{2, 3\}$, then find

(a) $(A \cap B) \times (B - C)$

(b) $A \cup (B \cap C)$. (5)

5. Find the real and imaginary parts of the complex number $Z = \frac{(3 + 2i)^2}{(4 - 3i)}$. (5)

6. Prove that

$$\left[\frac{1 + \cos \theta + i \sin \theta}{1 + \cos \theta - i \sin \theta} \right]^n = \cos(n\theta) + i \sin(n\theta). \quad (5)$$

7. If $y = (\tan x)^{\log x}$ find $\frac{dy}{dx}$. (5)

8. Evaluate : $\int x^2 \sin(2x) dx$. (5)

9. Solve : $(1 + x^2) \frac{dy}{dx} + 2xy = 4x^2$. (5)

SECTION B — (3 × 15 = 45 marks)

Answer any THREE questions.

(BIOSTATISTICS)

10. Find the mean, mode and median for the following data : (3 × 5 = 15)

Class	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	01	03	11	21	43	32	09

11. (a) Find the mean deviation from the median for the following data : (7)

Class	1-3	3-5	5-7	7-9	9-11	11-13	13-15	15-17
	06	53	85	56	21	26	04	04

- (b) The nicotine content in milligrams of two samples of tobacco were found to be as follows : (8)

Sample A	24	27	26	21	25	
Sample B	27	30	26	31	22	36

- Find the standard deviation for sample A and sample B.

12. (a) Find the coefficient of correlation between X and Y : (7)

X	165	166	167	167	168	169	170	172
Y	167	168	165	168	172	172	169	171

- (b) Obtain the equation for the regression line of Y on X for the following data : (8)

X	45	55	56	58	60	65	68	70	75	80	85
Y	56	50	48	60	62	64	65	70	74	82	90

13. (a) Explain simple random sampling. (7)

- (b) A bag contains 7 white and 9 black balls. Two balls are drawn in succession at random. What is the probability that one of them is white and the other is black? (8)

14. (a) The probability that a shooter A hits a target is $1/4$ and the probability that a shooter B hits it is $2/5$. What is the probability that the target will be hit if A and B both shoot at the target? (7)

- (b) An examination was given to 50 students at college A and to 60 students at college B . At A , the mean grade was 75 with a standard deviation of 9 and at B , the mean grade was 79 with a standard deviation of 7. Test the significance difference between the performance of the students at college A and B . Given that Z value at 5% level of significance is 1.96. (8)

FIRST B.Pharm. DEGREE EXAMINATION.

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Paper V — MATHEMATICS AND BIostatISTICS

Time : Three hours

Maximum : 75 marks

Answer Sections A and B in SAME answer book.

SECTION A — (6 × 5 = 30 marks)

(MATHEMATICS)

Answer any SIX questions.

1. Resolve into partial fractions : $\frac{x-2}{(x+2)(x-1)^2}$.

2. Sum the series : $1 + \frac{3}{4} + \frac{3 \cdot 5}{4 \cdot 8} + \frac{3 \cdot 5 \cdot 7}{4 \cdot 8 \cdot 12} + \dots$.

3. Given $A = \begin{bmatrix} 7 & 6 & 2 \\ -1 & 2 & 4 \\ 3 & 3 & 8 \end{bmatrix}$, find A^{-1} .

4. If $A = \{a, b, c, d, e\}$, $B = \{a, c, e, g\}$ and $C = \{b, e, f, g\}$, then verify that $(A \cup B) \cap C = (A \cap C) \cup (B \cap C)$.

5. Prove that $\left(\frac{\cos \theta + i \sin \theta}{\sin \theta + i \cos \theta}\right)^4 = \cos 8\theta + i \sin 8\theta$.

6. Expand $\frac{\sin 6\theta}{\sin \theta}$ in terms of powers of $\cos \theta$.

7. If $x^y = e^{x-y}$ prove that $\frac{dy}{dx} = \frac{\log x}{(1 + \log x)^2}$.

8. Solve : $(2x + 18y - 14)\frac{dy}{dx} = (6x + 5y - 7)$.

9. Solve : $2 \cos x \frac{dy}{dx} + 4y \sin x = \sin 2x$, given that $y = 0$ when $x = \frac{\pi}{3}$.

SECTION B — (3 × 15 = 45 marks)

(BIostatISTICS)

Answer any THREE questions.

10. (a) Explain the following :

- (i) Scope of statistical methods in medicine
- (ii) Classification and Tabulation of data.

(b) Calculate Mean, Median and mode for the following data showing the protein intake of 400 families.

Protein intake/ consumption unit/day (g) :	15 - 25	25-35	35-45	45-55
No. of families :	30	40	100	110
Protein intake/ consumption unit/day (g) :	55 - 65	65-75	75-85	
No. of families :	80	30	10	

11. (a) The following are the levels of triglycerides mgs/DL observed in 120 patients. Calculate the quartile deviation.

Triglyceride level :	60-70	70-80	80-90	90-100
No. of patients (f) :	14	16	25	35

Triglyceride level :	100-110	110-120	120-130
No. of patients (f) :	16	8	6

(b) The mean and standard deviation of 21 observations are 30 and 5 respectively. It was subsequently noted that one of the observations viz; 10 was incorrect. Omit it and determine the mean and standard deviation of the rest.

12. (a) The following data relate to the use of a hypotensive drug and the recovery times (minutes) based on 10 cases. Calculate Pearson's coefficient of correlation.

Drug used (mg) (X) :	2.26	1.81	1.72	1.54	2.06
Recovery time (minutes) (Y) :	7	10	18	4	10

Drug used (mg) (X) :	2.29	1.80	2.32	2.04	1.88
Recovery time (minutes) (Y) :	13	21	12	9	20

(b) Find the equations of regression lines to the above data given in question 12 (a).

13. (a) Explain the following :

- (i) Addition theorem on probability
- (ii) Multiplication theorem on probability.

(b) Two scientists A and B work independently to discover a new medicine for a disease. The probability that the first one will discover it is $\frac{3}{4}$ and the probability that the second one will discover it is $\frac{2}{3}$. What is the probability that the new medicine will be discovered?

14. (a) Explain the following :

- (i) Probability sampling techniques
- (ii) Test of significance
- (iii) Null Hypothesis.

(b) The following table gives the number of accidents that occurred in a factory during the days of the week. Test whether the accidents are uniformly distributed over the week.

Days :	Mon	Tue	Wed	Thurs	Fri	Sat
No. of accidents :	14	18	12	11	15	14

(Given the value of Chi-square significant at 5, 6, 7 degrees of freedom are respectively 11.07, 12.59, 14.07 at 5% level of significance)

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Paper V — MATHEMATICS AND BIostatISTICS

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Maximum : 75 marks

Answer Section A and B in the SAME Answer Books.

SECTION A — (6 × 5 = 30 marks)

(MATHEMATICS)

Answer any SIX questions.

1. Resolve into partial fraction $\frac{2x-1}{(x+2)(x-3)}$.
2. Sum the series $\frac{1}{1 \cdot 2} + \frac{1}{3 \cdot 4} + \frac{1}{5 \cdot 6} + \dots$
3. If $A = \begin{bmatrix} 5 & -4 & 3 \\ 2 & 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 & 4 \\ 2 & 0 & 1 \end{bmatrix}$ find $2A + B$ and $2B - A$.
4. If $A = \begin{bmatrix} 2 & 3 & 0 \\ 3 & -1 & 1 \end{bmatrix}$ find AA^T and $A^T A$.

5. Find the real and imaginary part of the complex number $\frac{2+3i}{-1+2i}$.

6. Simplify $\left(\cos \frac{2\pi}{3} + i \sin \frac{2\pi}{3}\right)^{30}$ using DeMoivre's theorem.

7. Differentiate $x^2 \sin 3x$.

8. Evaluate $\int \left(x^5 + 7x^4 + \frac{3}{x^3} + \frac{4}{x^2} + \frac{7}{x} + 3\right) dx$.

9. Solve: $\frac{dy}{dx} = \frac{x-2y+1}{2x-4y+3}$.

SECTION B — (3 × 15 = 45 marks)

(BIostatISTICS)

Answer any THREE questions.

10. (a) The following table gives the frequency distribution of the weekly wages of 100 workers in a drug manufacturing company.

Weekly wages :	20-25	25-30	30-35	35-40	40-45	45-50
No. of workers :	4	5	12	23	31	10
Weekly wages :	50-55	55-60	60-65			
No. of workers :	8	5	2			

Draw Histogram on the graph sheet. (7)

(b) From the following distribution find out mean and median. (8)

Class (X):	64	65	66	67	68	69	70	71	72	73
No. of students (f):	1	6	10	22	21	17	14	5	3	1

11. (a) Compute Standard Deviation for the following data : (8)

Class :	4-6	6-8	8-10	10-12	12-14	14-16
	13	111	182	105	19	07

(b) Performance of two teams A and B in Kho-Kho is as following : (7)

	A	B
Mean score :	8	14
Standard Deviation :	12	8

State with reasons which team is more consistent.

12. (a) Obtain the regression equation of Y on X from the following table and estimate the blood pressure when the age is 45 years. (7½)

Age :	56	42	72	36	63	47	55	49	38	42	68	60
Blood Pressure :	147	125	160	118	149	128	150	145	145	140	152	155

(b) Find the coefficient of correlation for the data given below :

Capital (X) :	10	20	30	40	50	60	70	80	90	100
Profit (Y) :	2	4	8	5	10	15	14	20	22	30

(7½)

13. (a) Average sales of Bata Shoe company's multiple shops are Rs. 12,500 per month with a standard deviation of Rs. 4,050. Find out what proportion of all shops sold between Rs. 12,500 and Rs. 16,550. (5)

(b) The mean wage of a certain group of workers is 500 rupees and σ (s.d) is 100. Find what percentage of workers get above 375 rupees. (5)

(c) If a distribution has a mean of 30 and σ (standard deviation) of 5, what area lies under the normal curve between the 30 and 38? (5)

14. (a) Define probability and sample space with example. ($2\frac{1}{2} + 2\frac{1}{2} = 5$)

(b) When a pair of dice is thrown, find the probability of getting sum 5 and sum 7. (5)

(c) A box contain 14 marbles of which 4 are red, 5 green and 5 blue, six marbles are drawn at random. Find the probability that out of these, exactly 3 are red. (5)

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FIRST B.Pharm. DEGREE EXAMINATION.

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Paper V — MATHEMATICS AND BIostatISTICS

Time : Three hours

Maximum : 75 marks

Two hours and

forty five minutes

for Sec. A and Sec. B

Sec. A & Sec. B : 60 marks

Sec. C : Fifteen minutes

Section C : 15 marks

Answer Sections A and B in the SAME Answer Books.

Answer Section C in the SEPARATE Answer Sheet.

SECTION A — (2 × 15 = 30 marks)

1. Answer (a) and (b) Or answer (c) and (d).

(a) Find the inverse of $\begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$

(b) Sum to infinity

$$1 - \frac{3}{5} + \frac{9}{25} - \frac{27}{125} + \dots$$

Or

(c) Find the cube roots of $(1 + i\sqrt{3})$.

(d) Solve : $(x - y - 2)dx - (2x - 2y - 3)dy = 0$.

2. Answer (a) and (b) Or answer (c) and (d).

(a) Explain two methods of classification.

(b) Find the mean, median and mode of :

Marks : 0 - 10 10 - 20 20 - 30 30 - 40 40 - 50

Students : 2 18 30 45 35

Marks : 50 - 60 60 - 70 70 - 80

Students : 20 6 3

Or

(c) Which of the players whose score in 12 rounds are given below is more consistent and why?

A : 74 75 78 72 78 77 79 81 79 76 72 71

B : 87 84 80 88 89 85 86 82 82 79 86 80

(d) Obtain the lines of regression and show them on graph for the following data :

X : 1 2 3 4 5 6 7 8 9

Y : 9 8 10 12 11 13 14 16 15

SECTION B — (6 × 5 = 30 marks)

3. Answer any SIX.

(1) If the 20% of the bolts produced by a machine are defective, determine the probability that out of 4 bolts chosen at random,

- (i) 1 will be defective
- (ii) 0 will be defective
- (iii) at most two will be defective.

(2) Resolve into partial fraction :

$$\frac{5x - 7}{(x + 5)(x + 7)(x + 3)}$$

(3) Prove that

$$\left[\frac{1 + \sin \frac{\pi}{8} + i \cos \frac{\pi}{8}}{1 + \sin \frac{\pi}{2} - i \cos \frac{\pi}{8}} \right]^{\frac{1}{2}} = \cos \frac{3\pi}{16} + i \sin \frac{3\pi}{16}$$

(4) Find Laplace transform of $L\{e^{-2t} \cos 5t\}$.

(5) Name the different types of diagrams and explain any one of them.

(6) Solve : $\frac{dy}{dx} + \frac{3y}{x} = \frac{1}{x^2}$.

(7) Calculate the co-efficient of correlation for the following data :

X: 23 27 28 29 30 31 33 35 36 39

Y: 18 22 23 24 25 26 28 29 30 32

(8) Find the standard deviation for the following data :

Class : 5 - 15 15 - 25 25 - 35 35 - 45 45 - 55

f : 8 12 15 9 6

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MATHEMATICS AND BIostatISTICS

Time : Three hours

Maximum : 75 marks

Sec. A & B : Two hours and
forty five minutes

Sec. A & B : 60 marks

M.C.Q. : Fifteen minutes

M.C.Q. : 15 marks

Answer Sections A and B in **SAME** Answer books.

Answer M.C.Q. in the **SEPARATE** answer sheet.

SECTION A — (2 × 15 = 30 marks)

1. Answer (a) and (b) or answer (c) and (d).

(a) If $A = \begin{bmatrix} 1 & -1 & -2 \\ 2 & 1 & 1 \\ 4 & -1 & -2 \end{bmatrix}$ find A^{-1} . (8)

(b) Prove that $3 + \frac{5}{1!} + \frac{7}{2!} + 3\frac{9}{3!} + \dots = 5e$. (7)

Or

(c) Find the cube roots of $(\sqrt{3} + i)$. (8)

(d) Solve : $(x^2 + y^2)dx = 2xy dy$. (7)

2. Answer (a) and (b) or answer (c) and (d).

(a) Describe the various measures of central tendency. (7)

(b) Find the mean and mode for the following data : (8)

Class : 0-10 10-20 20-30 30-40 40-50 50-60

f : 15 17 19 27 19 12

Or

(c) Two groups of patients in a hospital were treated with two medicines A and B to test the increase in the weights. Following table gives the weights in kgs. of the patients in each group : (7)

Group I : 42 39 48 60 41

Group II : 38 42 56 64 68 69 62

Find the standard deviation and coefficient of variation for Group I and Group II.

(d) If x is the level of water in inches used for irrigation land and y is the yield in kg per acre, obtain the linear regression equation of y on x from the following data :

x : 12 14 16 18 20 22 24 26 28 30

y : 400 410 430 440 420 460 470 450 390 400

Also estimate the value of y when $x = 32$ inches. (8)

SECTION B — (6 × 5 = 30 marks)

Answer any SIX :

3. A ball is drawn at random from a box containing 6 red balls, 3 white balls and 7 blue balls.

Find the probability that the ball is

- (a) red
 - (b) white
 - (c) blue
 - (d) not blue and
 - (e) red or white.
4. Resolve into partial fraction

$$\frac{2x^2 + 1}{(x + 2)(x - 1)^2}$$

5. Prove that

$$\left[\frac{1 + \cos\theta + i \sin\theta}{1 + \cos\theta - i \sin\theta} \right]^n = \cos(n\theta) + i \sin(n\theta).$$

6. Find the Laplace Transform of $e^{2t} \sin^2 t$.

7. Solve : $\frac{dy}{dx} + 2y \tan x = \sin x$.

8. Plot a histogram and a frequency curve on graph paper from the following data :

Blood pressure (in mm) : 70-74 75-79 80-84 85-89 90-94 95-99

Number of men : 06 18 46 17 06 02

9. Following data gives the heights of fathers (X) and their sons (Y) in inches :

X: 65 66 67 67 68 69 70 72

Y: 67 68 65 68 72 72 69 71

Find the coefficient of correlation between X and Y.

10. Find the quartile deviation for the following data :

Marks : 0-10 10-20 20-30 30-40 40-50

Number of students : 05 08 15 16 06

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Paper V — MATHEMATICS AND BIostatISTICS

Time : Three hours

Maximum : 75 marks

Sec. A & B : Two hours and
forty five minutes

Sec. A & B : 60 marks

M.C.Q. : Fifteen minutes

M.C.Q. : 15 marks

Answer Sections A and B in the SAME Answer Book.

SECTION A — (2 × 15 = 30 marks)

Answer the following questions.

1. (a) (i) Find the inverse of the matrix

$$A = \begin{bmatrix} 3 & 1 & 2 \\ 2 & -3 & -1 \\ 1 & 2 & 1 \end{bmatrix}$$

- (ii) Sum to infinity :

$$1 - \frac{1}{8} + \frac{1 \cdot 3}{8 \cdot 16} - \frac{1 \cdot 3 \cdot 5}{8 \cdot 16 \cdot 24} + \dots$$

- (iii) Prove that

$$1 + \frac{1+2}{2!} + \frac{1+2+3}{3!} + \dots = \frac{3}{2}e.$$

Or

- (b) (i) If $u = \log_e \tan\left(\frac{\pi}{4} + \frac{\theta}{2}\right)$ then prove that

$$\tanh\left(\frac{u}{2}\right) = \tan\left(\frac{\theta}{2}\right).$$

- (ii) Solve : $(xy^2 + x) dx + (yx^2 + y) dy = 0.$

- (iii) Solve : $(1 + x^2) \frac{dy}{dx} + 2xy = 4x^2.$

2. (a) (i) Find the mean, mode and median for the following data :

Class	0-4	4-8	8-12	12-16	16-20	20-24
<i>f</i>	4	6	8	12	7	2

(ii) Find the standard deviation for the following data :

Class	20-30	30-40	40-50	50-60	60-70	70-80	80-90
f	3	61	132	153	140	51	2

(iii) Find the mean deviation from the mean for the following frequency distribution :

Class	2-4	4-6	6-8	8-10
f	3	4	2	1

Or

(b) (i) Explain the terms : population, sample and sampling. Point out the difference between statistic and parameter as used in sampling theory.

(ii) The time-taken by workers in performing a job by Method-I and Method-II is given below :

Method-I	20	16	26	27	23	22	
Method-II	17	33	42	35	32	34	38

Do the data show that the variances of time distribution from population from which these samples are drawn do not differ significantly?

SECTION B — (6 × 5 = 30 marks)

Answer any SIX questions.

3. The probability that a student passes a physics test is $\frac{2}{3}$ and the probability that he passes both a Physics and an English test is $\frac{14}{45}$. The probability that he passes atleast one test is $\frac{4}{5}$. What is the probability that he passes the English test?

4. Resolve into partial fraction :

$$\frac{x+1}{x^2-5x+6}$$

5. Prove that

$$\left[\frac{1 + \cos \theta + i \sin \theta}{1 + \cos \theta - i \sin \theta} \right]^n = \cos(n\theta) + i \sin(n\theta).$$

6. Find the Laplace Transform of

$$\sin(3t) \cos(2t).$$

7. Draw a pie diagram to represent the following population in a town :

Males	:	2,000
Females	:	1,800
Girls	:	4,200
Boys	:	2,000
Total	:	10,000

8. Find the coefficient of correlation between X and Y for the following data :

X :	78	36	98	25	75	82	90	62	65	39
Y :	84	51	91	60	68	62	86	58	53	47

9. The probability that a contractor will get a plumbing contract is $\frac{2}{3}$ and the probability that he will not get an electric contract is $\frac{5}{9}$. If the probability of getting atleast one contract is $\frac{4}{5}$. What is the probability that he will get both the contracts?

10. Find the equation of the line of regression of y on x for the following data of the age of husband (X) and the age of wife (Y) :

X :	36	23	27	28	28	29	30	31	33	35
Y :	29	18	20	22	27	21	29	27	29	28