

FEBRUARY - 2005

[KM 705]

Sub. Code : 4165

FIRST B.Pharm. DEGREE EXAMINATION.

(Revised Regulations)

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

SECTION A — (2 × 15 = 30 marks)

Answer any TWO questions.

1. (a) Discuss briefly various methods of collecting primary data and compare them on any two aspects.

(b) What are ogives? How are they drawn? How are they used for estimating the quartiles? (8 + 7)

2. (a) Find mean, variance and coefficient of variation for the following data. (in suitable units)

Daily protein

intake	5-20	20-35	35-50	50-65	65-80	80-95
Number of Persons	18	24	132	74	23	9

(b) The mean and standard deviation of BP of 16 patients were 82 and 18 respectively. It was later on found that a reading 80 was recorded as 18. Find the correct mean and standard deviation. (8 + 7)

3. (a) Explain simple random sampling. Describe a method of drawing the same from a finite population.

(b) List the various properties and uses of normal distribution. (6 + 9)

4. (a) Distinguish between correlation and regression. Why are there two regression lines? What are their uses?

(b) From the following data on fat intake (X) and blood cholesterol level (Y) [in appropriately transformed units], estimate the expected fat intake for a cholesterol level of 40 and the expected cholesterol level for a fat intake of 18.

$N =$ number of persons sampled = 10

$\Sigma X = 130, \quad \Sigma Y = 550 \quad \Sigma X^2 = 1778$

$\Sigma Y^2 = 34490 \quad \Sigma XY = 7515.$

(6 + 9)

FEBRUARY - 2005

SECTION B — (6 × 5 = 30 marks)

Answer any SIX questions.

5. Resolve into partial fractions :

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

6. Using $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$

$$A = \{2, 4, 6, 8\} \text{ and } B = \{3, 6, 9\}.$$

Verify D'Morgan's laws.

7. Define singular, symmetric and identity (unit) matrices. Define also the inverse of the matrix. Find the

inverse of $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ with $ad - bc \neq 0$.

8. Sum to infinity the series :

$$\frac{1}{1 \cdot 2 \cdot 3} + \frac{1}{3 \cdot 4 \cdot 5} + \frac{1}{5 \cdot 6 \cdot 7} + \frac{1}{7 \cdot 8 \cdot 9} + \dots$$

9. Simplify $\frac{(\cos 2\theta + i \sin 2\theta)^4}{(\cos \theta - i \sin \theta)^3}$.

10. Find the expansion of $\sin^7 \theta$ in sines of multiples of θ .

11. Evaluate $\int \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx$.

12. Solve $(x + y)dy = (x - y)dx$.

13. Solve $\frac{dy}{dx} + y \cos x = \frac{1}{2} \sin 2x$.

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Theory : Two hours and
forty five minutes

Theory : 60 marks

M.C.Q. : Fifteen minutes

M.C.Q. : 15 marks

I. Answer ALL questions : (2 × 15 = 30)

1. Answer (a) or (b)

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

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 3 & 4 & 7 \\ 1 & -1 & 1 \end{bmatrix}.$$

(ii) Sum to infinity :

$$1 + \frac{2}{3} \cdot \frac{1}{2} + \frac{2 \cdot 5}{3 \cdot 6} \cdot \frac{1}{2^2} + \frac{2 \cdot 5 \cdot 8}{3 \cdot 6 \cdot 9} \cdot \frac{1}{2^3} + \dots$$

(iii) Prove that :

$$1 + \frac{3}{1!} + \frac{5}{2!} + \frac{7}{3!} + \dots = 3e.$$

Or

(b) (i) Find the cube root of $(1 + i\sqrt{3})$

(ii) Solve : $\frac{dy}{dx} = e^{x+y} + x^2 e^y$

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

2. Answer (a) or (b) :

(a) (i) Find the median and mode for the following data :

Class : 0-7 7-14 14-21 21-28 28-35 35-42 42-49

f: 19 25 36 72 51 43 28

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

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

f: 18 16 15 12 10 05

(iii) Find the mean deviation from the mean for the following observations :

20 22 27 30 31 32 35 40 45

Or

AUGUST - 2005

(b) (i) Find the Quartile Deviation for the following frequency distribution :

Marks obtained :	20-30	30-40	40-50	50-60	60-70	70-80
Number of students :	5	20	14	10	8	5

(ii) The nicotine contents in milligrams of two samples of tobacco were found to be as follows :

Sample - A : 26 21 25 24 27

Sample - B : 28 31 22 27 30 36

Find the mean, standard deviation and coefficient of variation for Sample - A and Sample - B.

II. Answer any SIX questions : (6 × 5 = 30)

1. A husband and wife appear in an interview for two vacancies in the same post. The probability of husband's selection is $\frac{1}{7}$ and that of wife's selection is $\frac{1}{5}$. What is the probability that

- (a) both of them will be selected and
- (b) only one of them will be selected?

2. Resolve into partial fractions : $\frac{3x+1}{x^2(x+1)(x-1)}$.

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

4. Find the Laplace Transform of $\sin^2(4t)$.

5. Draw a histogram for the following data on graph paper :

Class : 0-10 10-20 20-30 30-40 40-50 50-60 60-70

f : 5 10 15 21 11 10 4

6. Find the coefficient of correlation between the industrial production (x) and export (y) using the following data :

x : 55 56 58 59 60 60 62

y : 35 38 38 39 44 43 44

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

8. Obtain the regression equation of y on x from the following data :

x : 6 2 10 4 8

y : 9 11 5 8 7

FEBRUARY - 2006

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Theory : 60 marks

M.C.Q. : Fifteen minutes

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I. Long Essay : (2 × 15 = 30)

Answer any TWO questions.

1. (a) Describe any two methods of collecting primary data.

(b) Draw histogram and frequency curve from the following data.

Class interval : 30-40 40-50 50-60 60-70 70-80 80-90

Frequency : 18 37 45 27 15 8

(7 + 8)

2. Calculate median and coefficient of variation for the following data on protein intake per day.

Protein intake per day : 5-19 20-34 35-49 50-64 65-79

No. of families : 6 20 45 24 5

3. Define correlation and regression. Find the correlation coefficient and write down the regression equations for the following data.

$$n = 6, \quad \sum x = 42, \quad \sum y = 78, \quad \sum x^2 = 342, \\ \sum y^2 = 1080, \quad \sum xy = 594.$$

4. (a) Write notes on systematic random sampling and probability.

(b) Test for the significant difference between the mean anxiety scores of two groups of patients for the following data.

	Group	
	A	B
Number	100	200
Mean anxiety scores	56	51
S.D. scores	10	10

5% z value is 1.96.

(7 + 8)

II. Short notes :

(6 × 5 = 30)

Answer any SIX questions.

1. Resolve into partial fractions $\frac{2x-1}{(x+2)(x-3)}$.

2. Sum to infinity $1 + \frac{2}{6} + \frac{2 \cdot 5}{6 \cdot 12} + \frac{2 \cdot 5 \cdot 8}{6 \cdot 12 \cdot 18} + \dots$

FEBRUARY - 2006

3. 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 $5A - 4B + 3C$.

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

5. Find the real imaginary parts of $\frac{2+3i}{-1+2i}$.

6. Expand $\cos 4\theta$ in powers of $\sin \theta$.

7. Differentiate $3x^5 \log x$ with respect to x .

8. Evaluate $\int_1^2 \left(x^2 - 3x^{1/2} + \frac{1}{x^e} \right) dx$.

9. Solve $x \frac{dy}{dx} + y \log x = e^x x^{\frac{1}{2}} \log x$.

AUGUST - 2006

[KP 705]

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Time : Three hours

Maximum : 75 marks

Theory : Two hours and
forty five minutes

Theory : 60 marks

M.C.Q. : Fifteen minutes

M.C.Q. : 15 marks

I. Answer any TWO questions : (2 × 20 = 40)

1. (a) Define mean, mode and median for a frequency distribution.

(b) Find the mode and median for the following data :

Class	4-8	8-12	12-16	16-20	20-24	24-28
<i>f</i>	6	10	18	30	15	12

2. (a) Find the mean deviation from the mean from the following observations :

20 22 27 30 31 32 35 40 45.

(b) Find the standard deviation and variance for the following data :

Age in years : 20-30 30-40 40-50 50-60 60-70 70-80 80-90

Number of men : 3 61 132 153 140 51 2

3. (a) Find the Quartile Deviation for the following data :

Marks : 0-5 5-10 10-15 15-20 20-25 25-30

Number of students : 4 6 8 12 7 2

(b) Below is given the frequency distribution of weights of a group of 60 students of a class :

Weight in kg : 30-34 35-39 40-44 45-49 50-54 55-59 60-64

Number of students : 03 05 12 18 14 06 02

Draw a histogram for the above data and hence find the modal value.

AUGUST - 2006

4. (a) Find the coefficient of correlation between the industrial production (X) and export (Y) using the following data :

$X:$	55	56	58	59	60	60	62
$Y:$	35	38	38	39	44	43	44

(b) A husband and wife appear in an interview for two vacancies in the same post. The probability of husband's selection is $1/7$ and that of wife's selection is $1/5$. What is the probability that

- (i) both of them will be selected
- (ii) only one of them will be selected and
- (iii) none of them will be selected?

II. Short notes : (4 × 5 = 20)

Answer any FOUR questions.

1. Resolve into partial fractions :

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

2. If $A = \begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$, find A^{-1} .

3. If $A = \begin{pmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{pmatrix}$, find AA' and $A'A$.

4. Simplify :

$$\frac{(\cos \theta + i \sin \theta)^3 (\cos \theta - i \sin \theta)^{-5}}{(\cos 4\theta + i \sin 4\theta)^5 (\cos 3\theta + i \sin 3\theta)^2}$$

5. Find the cube roots of $(1+i)$ and represent them in the Argand diagram.

6. Sum to infinity :

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

7. Evaluate : $\int x^2 \sin x dx$.

FEBRUARY - 2007

[KQ 705]

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Maximum : 75 marks

Theory : Two hours and
forty five minutes

Theory : 60 marks

M.C.Q. : Fifteen minutes

M.C.Q. : 15 marks

Answer any TWO questions.

I. Long Essay : (2 × 20 = 40)

1. (a) Describe any one method of collecting primary data.

(b) Write down the parts of a table.

(c) Write notes on simple random sampling.

(d) Write down the various steps to be followed in test of hypothesis.

2. (a) Draw histogram and frequency polygon for the following data :

Marks : 0-20 20-40 40-60 60-80 80-100

No. of students : 8 20 35 15 7

(b) Calculate mode and coefficient of variation from the following :

Protein intake

per day : 5-19 20-34 35-49 50-64 65-79

Number of

families : 6 20 45 24 5

3. Define correlation and regression with example. Calculate the coefficient of correlation and form the regression lines for the following data :

X: 1 2 3 4 5 6 7

Y: 9 8 10 12 11 13 14

4. (a) Define probability and sample space.

(b) A bag contains 7 white and 9 black balls. Two balls are drawn at random. What is the probability that both are of same colour?

(c) A new drug was given to 150 cases and it cured 85% of them. Can we consider that it is better than the usual drug which cures 75%? Given 5% Z value is 1.96 and 5% Z value is 2.58.

FEBRUARY - 2007

Answer any FOUR questions.

II. Short notes : (4 × 5 = 20)

1. Resolve into partial fractions $\frac{x+1}{x(x+2)(x+3)}$.

2. 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

$$(AB)' = B'A'.$$

3. Differentiate $\frac{2x}{3x^3+7}$ with respect to x .

4. Integrate $\sqrt{3+2x}$ with respect to x .

5. Solve $\frac{dy}{dx} = \frac{x+2y-3}{2x+y-3}$.

6. Simplify $\frac{(\cos 2\theta + i \sin 2\theta)^4 (\cos 3\theta - i \sin 3\theta)^4}{(\cos \theta - i \sin \theta)^2 (\cos 4\theta + i \sin 4\theta)^2}$.

7. Given that $A = (0, 1, 3, 5)$, $B = (1, 2, 4, 7)$ at $C = (1, 2, 3, 5, 8)$. Prove that

(a) $(A \cup B) \cap C = (A \cap C) \cup (B \cap C)$

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