Roll No. .....

Question Booklet Number

O. M. R. Serial No. | | | | | | | |

M. Sc. (Fourth Semester)
(NEP) EXAMINATION, 2025-26
STATISTICS
(Actuarial Statistics) (Elective)

Paper Code							
B	0	6	1	0	0	4	T

Questions Booklet Series
C

Time : 1:30 Hours] [*Maximum Marks : 75*

Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.

2. The booklet contains 100 questions. Examinee is required to answer 75 questions in the OMR Answer-Sheet provided and not in the question booklet. All questions carry equal marks.

3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.

परीक्षार्थियों के लिए निर्देश :

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।

2. प्रश्न-पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को 75 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। सभी प्रश्नों के अंक समान हैं।

3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न-पुस्तिका तथा OMR आन्सर-शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न-पुस्तिका जिसमें कुछ भाग छपने से छूट गए हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।

(Remaining instructions on the last page) **(शेष निर्देश अन्तिम पृष्ठ पर)**

(Only for Rough Work)

1. Ethical dimensions include :

(A) Use of gender/genetics in pricing

(B) PC speed

(C) Font size

(D) Book cover

2. "Benefit of survival" in annuities comes from :

(A) Interest only

(B) Redistribution of funds from those who died

(C) Government

(D) Stocks

3. Net Level Premium is paid :

(A) Once

(B) In equal installments

(C) Last year

(D) Randomly

4. D_x is defined as :

(A) $v^x \cdot l_x$

(B) $v \cdot q_x$

(C) $\frac{l_x}{v}$

(D) $i \cdot l_x$

5. M_x is the sum of :

(A) C_y from x to ω

(B) D_y from x to ω

(C) l_x and d_x

(D) Interest

6. Complete Annuity includes :

(A) Final pro-rata payment

(B) No payment

(C) 200 year payment

(D) Payment to insurer

7. Life Annuity with monthly payments is :

(A) $a_x^{(12)}$

(B) a_x^{12}

(C) $12a_x$

(D) a_{x+12}

8. Relation between A_x and $\ddot{a}_x$:

(A) $A_x = 1 - d\ddot{a}_x$

(B) $A_x = 1 + d\ddot{a}_x$

(C) $A_x = \frac{\ddot{a}_x}{i}$

(D) $A_x = \ddot{a}_x \cdot v$

9. Pure Endowment pays only if :

(A) Person survives to end of term

(B) Person dies

(C) Every year

(D) At start

10. "Selection" in insurance refers to :

(A) Office furniture

(B) Underwriting/medical filtering

(C) Random picking

(D) Logo color

11. Most significant mortality factor :

(A) Hair color

(B) Age and gender

(C) Music

(D) Car color

12. Level Benefit insurance sum :

(A) Increases

(B) Decreases

(C) Remains constant

(D) Inflation linked

13. Insurance payable at moment of death is :

(A) $\bar{A}_x$

(B) $\ddot{A}_x$

(C) $A_x^{(m)}$

(D) A_x^2

14. Recursion formulas allow :

(A) Finding value for x using $x + 1$

(B) Stock prediction

(C) Avoiding math

(D) Age 0 only

15. Temporary Life Annuity pays for :

(A) Rest of life

(B) Max n years while alive

(C) Exactly 5 years

(D) One day

16. Varying Benefit Insurance means :

(A) Sum insured changes over time

(B) Name change

(C) Age change

(D) Variable rate

17. Net Single Premium is :

(A) Monthly

(B) Lump sum for expected benefit cost

(C) Tax

(D) Commission

18. Commutation Functions simplify :

(A) Weather

(B) Manual APV calculations

(C) Distances

(D) Stocks

19. Life Annuity-Due $(\ddot{a}_x)$ pays :

(A) End of period

(B) Beginning of period

(C) Birthday

(D) Age 65

20. Continuous Life Annuity $(\bar{a}_x)$ pays :

(A) At year end

(B) At year start

(C) Continuously while alive

(D) $1M daily

21. Life Annuity payments are made :

(A) Once

(B) While person is alive

(C) To heirs

(D) By government

22. Deferred Insurance starts :

(A) Immediately

(B) After a waiting period

(C) After death

(D) After last premium

23. Endowment Insurance pays if :

(A) Dies within term

(B) Survives term

(C) Either (A) or (B)

(D) Loses job

24. Term Insurance benefit is paid :

(A) Only if death occurs within a specified term

(B) For rest of life

(C) Annually

(D) At marriage

25. Whole Life Insurance benefit is paid :

(A) Within 10 years

(B) Whenever death occurs

(C) At age 100

(D) For accidents only

26. As n increases, v^n :

(A) Increases

(B) Constant

(C) Decreases

(D) Negative

27. Individual risk models focus on :

(A) Economy

(B) Fixed number of contracts

(C) High risk only

(D) Bonds

28. Standard Deviation Principle loading is based on :

(A) Mean squared

(B) Multiple of standard deviation

(C) Actuary age

(D) Number of pages

29. For continuous compounding, i = :

(A) $e^{\delta} - 1$

(B) $\ln (1 + \delta)$

(C) δ

(D) $\frac{1}{\delta}$

30. Nominal rates are converted to Effective rates for :

(A) Making them smaller

(B) Comparison on annual basis

(C) Tax reasons

(D) Calculating μ_x

31. Sum of independent claims is approximated via CLT when n is :

(A) Small

(B) Large

(C) Zero

(D) Odd

32. d is related to i by :

(A) $d = \frac{i}{(1+i)}$

(B) $d = i(1+i)$

(C) $d = 1+i$

(D) $d = \sqrt{i}$

33. If i = 10%, v is :

(A) 0.9091

(B) 1.10

(C) 0.10

(D) 1.00

34. Force of Discount in continuous time is :

(A) Equal to force of interest

(B) Double the interest

(C) Zero

(D) Negative

35. Exponential Premium Principle comes from :

(A) Linear utility

(B) Exponential utility

(C) Log utility

(D) No utility

36. Translation Invariant Property means :

(A) Premium is zero

(B) $H(X + c) = H(X) + c$

(C) $H(X) = \text{Max}(X)$

(D) Ignore variance

37. Individual Risk Model assumes that claims are :

(A) Dependent

(B) Independent

(C) Decreasing

(D) Fixed

38. Present Value of 1 due in n years is :

(A) v^n

(B) $(1 + i)^n$

(C) $n \cdot v$

(D) i^n

39. If δ is constant, accumulation at time t is :

(A) $e^{\delta t}$

(B) $1+\delta t$

(C) δ^t

(D) $\ln(\delta t)$

40. Accumulation Factor scales :

(A) Present value to future value

(B) Future value to present value

(C) Mortality

(D) Premium

41. Compound Interest means :

(A) Actuaries only

(B) Interest earns interest

(C) 10% fixed

(D) Simple growth

42. Variance Premium Principle is :

(A) E [X]

(B) E [X] + αVar (X)

(C) $\sqrt{\text{Var(X)}}$

(D) $\frac{\text{E(X)}}{\text{Var(X)}}$

43. "Loading" covers :

(A) Premium reductions

(B) Expenses, profit, and contingencies

(C) Data entry

(D) Physical weight

44. Equivalence Principle states :

(A) E[PV (Premiums)] = E [PV (Benefits)]

(B) Wealth = Utility

(C) Interest = Discount

(D) P = $\frac{1}{v}$

45. A discount rate *d* of 5% means :

(A) Interest paid at end

(B) Interest deducted at start

(C) No interest

(D) 5% above bank rate

46. Nominal rate compounded *m* times a year is :

(A) i

(B) $i^{(m)}$

(C) d

(D) δ

47. Continuous compounding uses the constant :

(A) π

(B) e

(C) i

(D) ϕ

48. Discount factor *v* is :

(A) $1 + i$

(B) $\frac{1}{(1+i)}$

(C) $\frac{i}{(1+i)}$

(D) $1 - i$

49. Force of interest δ is :

(A) $\ln (1 + i)$

(B) e^i

(C) $1 - i$

(D) i^2

50. Accumulation factor for 1 unit over *n* years at rate *i* is :

(A) $(1+i)^n$

(B) $(1+i)^{-n}$

(C) $n(1+i)$

(D) $\frac{i}{n}$

51. In a life table, T_x is :

(A) Total years lived by the cohort after age x

(B) Probability of survival

(C) Time unit death

(D) Tax at age x

52. Survival models are essentially :

(A) Time-to-event models

(B) Stock price models

(C) Weather models

(D) Geometry models

53. ${}_nL_x$ represents :

(A) Deaths between x and $x + n$

(B) Person-years lived between x and $x + n$

(C) Death probability

(D) Survivors at x

54. The Lee-Carter model is used for :

(A) Car insurance

(B) Forecasting mortality rates

(C) Interest rates

(D) Fire insurance

55. "Mortality Projection" accounts for :

(A) Improving life expectancy over time

(B) Constant mortality

(C) Increasing death rates

(D) Static data

56. The symbol for complete expected future lifetime is :

(A) e_x

(B) $\mathring{e}_x$

(C) q_x

(D) l_x

57. "Fractional Ages" refer to :

(A) Ages 0-1

(B) Non-integer ages

(C) Infant mortality

(D) Prime numbers

58. "de Moivre's Law" assumes the survival function is :

(A) Exponential

(B) Linear

(C) Log-normal

(D) Constant

59. Which Law assumes μ_x is constant ?

(A) Gompertz

(B) Makeham

(C) Exponential/Constant Force

(D) Weibull

60. d_x is defined as :

(A) $l_x = l_{x+1}$

(B) $l_x + l_{x+1}$

(C) $\frac{l_x}{l_{x+1}}$

(D) $l_x . l_{x+1}$

61. The "Radix" of a life table (l_0) is usually :

(A) 0

(B) 1

(C) A large arbitrary number (e.g., 1,00,000)

(D) Average age

62. If ${}_tp_x = 0.85$, then ${}_tq_x$ is :

(A) 0.15

(B) 0.05

(C) 0.85

(D) 1.00

63. The "Central Death Rate" m_x is :

(A) $\frac{d_x}{l_x}$

(B) $\frac{d_x}{L_x}$

(C) Survivors/deaths

(D) Premiums/claims

64. The "Uniform Distribution of Deaths" (UDD) assumption implies :

(A) No death occur

(B) Deaths are spread evenly throughout the year of age

(C) Everyone dies on birthdays

(D) Everyone dies in winter

65. An "Ultimate Life Table" is used when :

(A) The effect of initial medical selection has worn off

(B) Moment of death occurs

(C) No one is left

(D) Bankruptcies occur

66. A "Select Life Table" is used when mortality depends on :

(A) Age only

(B) Age and duration since insurance issue

(C) Gender only

(D) Location only

67. The "Limiting Age" (ω) is where :

(A) Everyone is born

(B) $S(\omega) = 0$

(C) Premiums double

(D) $\mu_x = 0$

68. "Makeham's Law" improve Gompertz Law by adding :

(A) An age-independent constant for accidental deaths

(B) A square root factor

(C) A logarithmic factor

(D) A negative factor

69. "Gompertz Law" assumes the force of mortality :

(A) is constant

(B) increases exponentially with age

(C) decreases with age

(D) is linear

70. The "Curtate Future Lifetime" K_x is :

(A) Continuous time until death

(B) Integer number of completed years lived before death

(C) Retirement age

(D) Maximum age

71. What does ${}_tq_x$ denote ?

(A) Probability (x) survives t years

(B) Probability (x) dies within t years

(C) Total number of people alive

(D) Interest rate

72. What does ${}_tp_x$ denote in actuarial notation ?

(A) Probability (x) dies with t years

(B) Probability (x) survives at least t more years

(C) Premium for t years

(D) Force of interest

73. The "Uncertainty of age at death" is modelled by the random variable :

(A) X (Age at death)

(B) I (Interest)

(C) P (Premium)

(D) V (Volume)

74. The "Force of Mortality" μ_x is mathematically defined as :

(A) $-\frac{1}{S(x)}\frac{d}{dx}S(x)$

(B) The total number of deaths

(C) Probability of surviving 10 years

(D) Square root of age

75. The "Survival Function" $S(x)$ represents the probability that :

(A) A person dies before age x

(B) A person survives at least to age x

(C) A person dies exactly at age x

(D) A person is born at age x

76. The sum of n independent Poisson random variables follows a :

(A) Normal distribution

(B) Poisson distribution

(C) Binomial distribution

(D) Exponential distribution

77. Utility functions are usually assumed to be :

(A) Non-decreasing

(B) Non-increasing

(C) Periodic

(D) Quadratic only

78. The "Mean-Value Principle" states premium is :

(A) E [X]

(B) E [X] + loading

(C) Max (X)

(D) Median (X)

79. "Model for individual claims" usually considers X = I·B, where I is :

(A) Interest rate

(B) Indicator variable for claim occurrence

(C) Income

(D) Insurance type

80. In utility theory, "wealth" (w) is usually treated as :

(A) A constant

(B) A negative number

(C) The independent variable in the utility function

(D) The slope of the curve

81. Which of the following represents a "Continuous" probability distribution ?

(A) Poisson

(B) Binomial

(C) Exponential

(D) Hypergeometric

82. A risk-neutral person evaluates a gamble based solely on :

(A) Maximum loss

(B) Variance

(C) Expected value

(D) Minimum gain

83. Insurance helps in "risk-pooling" which primarily reduces :

(A) The expected loss

(B) The variance of the average loss

(C) Total number of claims

(D) The tax rate

84. In the Individual Risk Model, the "Sum of independent claims" is often approximated using :

(A) Gamma distribution

(B) Normal distribution

(C) Constant value

(D) Uniform distribution

85. A "pure premium" is defined as :

(A) Premium including all expenses

(B) The expected value of the loss

(C) Premium paid by the government

(D) Tax on the policy

86. A "Compound Poisson Process" is used to model :

(A) Only the number of claims

(B) Only the size of claims

(C) The total aggregate claims over time

(D) Central bank interest rates

87. The "adjustment coefficient" is a concept related to :

(A) Customer service scores

(B) The probability of ruin in insurance models

(C) The agent's commission

(D) Physical age

88. If a utility functions is $u(w) = w$, the person is :

(A) Risk-averse

(B) Risk-neutral

(C) Risk-seeking

(D) Risk-intolerant

89. Jensen's Inequality is used in utility theory to show that :

(A) $E[u(w)] \leq u(E[w])$ for a concave utility function

(B) $E[u(w)] = u(E[w])$ always

(C) Premiums are always zero

(D) Risk-averse people love gambling

90. Which distribution is frequently used to model the severity (size) of large insurance claims ?

(A) Binomial

(B) Bernoulli

(C) Pareto

(D) Geometric

91. The "Principle of Equivalence" suggests that :

(A) Expected Income = Expected Outgo

(B) Utility = Wealth

(C) Interest = Discount

(D) Life = Death

92. In a "Stop-Loss" insurance model, the insurer pays :

(A) Nothing until a specific aggregate loss threshold is met

(B) Every claim from the first dollar

(C) Only the administrative fees

(D) A fixed amount regardless of the claim size

93. The "Law of Large Numbers" is fundamental to insurance because :

(A) It predicts exactly who will die

(B) It ensures the average loss becomes more predictable as the number of independent exposure units increases

(C) It makes the utility function linear

(D) It reduces the premium to zero

94. "Utility" in Actuarial Statistics is a measure of :

(A) Monetary profit

(B) Satisfaction or value assigned to a specific wealth level

(C) The number of active policies

(D) The duration of a contract

95. If $u(w) = \sqrt{w}$, the individual is considered :

(A) Risk-neutral

(B) Risk-seeking

(C) Risk-averse

(D) Risk-blind

96. The "Individual Risk Model" assumes that :

(A) All policyholders are related

(B) Claims from different policies are independent random variables

(C) Only one person can ever make a claim in a year

(D) The premium is always equal to the claim

97. According to the expected utility criterion, an individual buys insurance if :

(A) The premium is zero

(B) Expected utility with insurance > expected utility without insurance

(C) The utility of the premium is zero

(D) The insurance company has a high utility function

98. A "mixed probability distribution" in insurance often occurs when :

(A) There is a probability mass at zero and a continuous distribution for positive claims

(B) Two different insurance companies merge

(C) The premium is paid in different currencies

(D) The policyholder has multiple types of insurance

99. In utility theory, a risk-averse individual has a utility function that is :

(A) Linear

(B) Convex

(C) Concave

(D) Exponentially increasing

100. Which distribution is commonly used to model the number of insurance claims ?

(A) Uniform distribution

(B) Poisson distribution

(C) Normal distribution

(D) Beta distribution

(Only for Rough Work)

4. Four alternative answers are mentioned for each question as—A, B, C & D in the booklet. The candidate has to choose the correct answer and mark the same in the OMR Answer-Sheet as per the direction :

Example :

Question :

Q. 1 (A) ● (C) (D)
Q. 2 (A) (B) ● (D)
Q. 3 (A) ● (C) (D)

Illegible answers with cutting and over-writing or half filled circle will be cancelled.

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
6. All answers are to be given on OMR Answer Sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.
7. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
8. After the completion of the examination candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.
9. There will be no negative marking.
10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
11. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
12. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

Impt. : On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर—A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से सही उत्तर छाँटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ● (C) (D)
प्रश्न 2 (A) (B) ● (D)
प्रश्न 3 (A) ● (C) (D)

अपठनीय उत्तर या ऐसे उत्तर जिन्हें काटा या बदला गया है, या गोले में आधा भरकर दिया गया, उन्हें निरस्त कर दिया जाएगा।

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
7. ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न-पुस्तिका ले जा सकते हैं।
9. निगेटिव मार्किंग नहीं है।
10. कोई भी रफ कार्य, प्रश्न-पुस्तिका के अन्त में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैलकुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
12. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

महत्वपूर्ण : प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्न-पुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्न-पुस्तिका प्राप्त कर लें।