

Entrance Examination for Admission to the P.G. Courses in the Teaching Departments, 2024

CSS

ACTUARIAL SCIENCE

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General Instructions

1. The Question Paper is having 100 Objective Questions, each carrying one mark.
2. The answers are to be (✓) 'tick marked' **only** in the "**Response Sheet**" provided.
3. **Negative marking** : **0.25 marks** will be deducted for each wrong answer .

Time : 2 Hours

Max. Marks : 100

To be filled in by the Candidate									
Register Number	in Figures								
	in words								

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Choose appropriate answer from the options in the questions. **(100 × 1 = 100 marks)**

1. Which of the following statements is true regarding the convergence of a series?
 - A. If the series converges, then the terms of the series must tend to zero
 - B. If the terms of the series tend to zero, then the series must converge
 - C. If the series converges, then the terms of the series must be bounded
 - D. If the terms of the series are bounded, then the series must converge

DO NOT WRITE HERE

2. If $f(x) = x^3 + 2x^2 - 3x + 1$, what is $f'(x)$?

A. $3x^2 + 4x - 3$

B. $3x^2 + 4x + 3$

C. $3x^2 + 2x - 3$

D. $3x^2 + 2x + 1$

3. What is the value of $\lim_{x \rightarrow 0} \frac{\sin(x)}{x}$?

A. 0

B. 1

C. ∞

D. does not exist

4. If A is an $n \times n$ matrix and $A^2 = I$, where I is the identity matrix, what can be said about A ?
- A. A is not invertible
 B. A is symmetric
 C. A is orthogonal
 D. A is invertible
5. What is the derivative of $\ln(x)$ with respect to x ?
- A. $\frac{1}{x^2}$
 B. $\frac{1}{x}$
 C. x
 D. $\frac{1}{\ln(x)}$
6. Which of the following is the Maclaurin series expansion for $\sin(x)$?
- A. $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$
 B. $1 - x + \frac{x^2}{2!} - \frac{x^3}{3!} + \dots$
 C. $\frac{x}{1!} - \frac{x^2}{2!} + \frac{x^3}{3!} - \frac{x^4}{4!} + \dots$
 D. $1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$
7. What is the volume of the solid generated by revolving the region bounded by $y = x^2$ and $y = 2x$ about the y -axis?
- A. π
 B. 4π
 C. 8π
 D. 16π
8. If $f(x) = e^x$, what is $f''(x)$?
- A. e^x
 B. $-e^x$
 C. $e^x + 1$
 D. $e^x - 1$
9. Which of the following integrals represents the area under the curve $y = \sin(x)$ from $x = 0$ to $x = \pi$?
- A. $\int_0^{\pi} \sin(x) dx$
 B. $\int_0^{\pi} \cos(x) dx$
 C. $\int_0^{\pi} -\sin(x) dx$
 D. $\int_0^{\pi} -\cos(x) dx$

10. What is the value of $\lim_{x \rightarrow \infty} \frac{e^x}{x}$?
- A. 0
B. 1
C. ∞
D. does not exist
11. What is the solution to the differential equation $\frac{dy}{dx} = 3x^2$ with initial condition $y(0) = 2$?
- A. $y = x^3 + 2$
B. $y = x^3 + 3$
C. $y = x^3 + 2x + 2$
D. $y = x^3 + 3x + 2$
12. Which of the following is the Taylor series expansion of e^x about $x = 0$?
- A. $1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$
B. $1 - x + \frac{x^2}{2!} - \frac{x^3}{3!} + \dots$
C. $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$
D. $\frac{x}{1!} - \frac{x^2}{2!} + \frac{x^3}{3!} - \frac{x^4}{4!} + \dots$
13. What is the area enclosed by the curve $y = \sqrt{x}$, the x -axis, and the lines $x = 1$ and $x = 4$?
- A. $\frac{9}{2}$
B. $\frac{13}{3}$
C. $\frac{5}{2}$
D. $\frac{7}{3}$
14. If $f(x) = \frac{1}{x}$, what is $f''(x)$?
- A. $-\frac{2}{x^3}$
B. $\frac{2}{x^3}$
C. $-\frac{1}{x^2}$
D. $\frac{1}{x^2}$

15. Which of the following statements is true about the convergence of improper integrals?
- A. If an improper integral diverges, then the integral of unbounded
 - B. If an improper integral converges, then the function must be bounded on the interval of integration
 - C. If an improper integral diverges, then the function must be unbounded on the interval of integration
 - D. If an improper integral converges, then the function must be continuous on the interval of integration
16. What is the limit of $\frac{\cos(x)-1}{x}$ as x approaches 0?
- A. 0
 - B. ∞
 - C. $-\infty$
 - D. does not exist
17. Which of the following matrices is singular?
- A. $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$
 - B. $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$
 - C. $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$
 - D. $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$
18. What is the integral of $\frac{1}{1+x^2}$ with respect to x ?
- A. $\tan^{-1}(x)+C$
 - B. $\frac{1}{x+C}$
 - C. $\frac{x}{1+x^2}+C$
 - D. $\ln|x+1|+C$
19. What is the sum of the series $\sum_{n=1}^{\infty} \frac{1}{n^2}$?
- A. $\frac{\pi^2}{6}$
 - B. $\frac{\pi}{6}$
 - C. $\frac{\pi^2}{4}$
 - D. $\frac{\pi}{4}$

37. What does the term “degrees of freedom” represent in statistics?
- A. The number of observations in the dataset
 - B. The number of independent variables in a regression model
 - C. The number of parameters estimated minus the number of constraints in the model
 - D. The number of sample points used to estimate a population parameter
38. Which of the following is a measure of dispersion?
- A. Median
 - B. Mode
 - C. Variance
 - D. Mean
39. What is the standard deviation of a dataset?
- A. The average deviation from the mean
 - B. The square root of the variance
 - C. The range of the dataset
 - D. The maximum value in the dataset
40. What does a small p -value indicate in hypothesis testing?
- A. Strong evidence against the null hypothesis
 - B. Weak evidence against the null hypothesis
 - C. Support for the null hypothesis
 - D. Inconclusive evidence regarding the null hypothesis
41. What is the purpose of a confidence interval in statistics?
- A. To estimate the range of population parameters with a certain level of confidence
 - B. To determine the sample size needed for a hypothesis test
 - C. To determine the critical value for a hypothesis test
 - D. To summarize the data using a single value

42. Which of the following is NOT a type of probability sampling method?
- A. Simple random sampling B. Systematic sampling
C. Convenience sampling D. Stratified sampling
43. What is the formula for the coefficient of variation?
- A. $\frac{\text{Standard deviation}}{\text{Mean}} \times 100\%$ B. $\frac{\text{Mean}}{\text{Standard deviation}} \times 100\%$
C. $\frac{\text{Variance}}{\text{Mean}} \times 100\%$ D. $\frac{\text{Mean}}{\text{Variance}} \times 100\%$
44. Which statistical test is used to determine if there is a significant association between two categorical variables?
- A. Chi-square test B. *t*-test
C. ANOVA D. Regression analysis
45. In hypothesis testing, what is the Type II error?
- A. Failing to reject the null hypothesis when it is false
B. Rejecting the null hypothesis when it is true
C. Accepting the null hypothesis when it is false
D. Accepting the null hypothesis when it is true
46. What does the term “skewness” refer to in statistics?
- A. The spread of the data around the mean
B. The symmetry of the distribution
C. The shape of the tails of the distribution
D. The presence of outliers in the data

51. What is the purpose of actuarial science?
- A. To analyze financial risks using mathematical and statistical methods
 - B. To predict future stock market trends
 - C. To provide investment advice to clients
 - D. To develop new insurance products
52. Which of the following is NOT a common actuarial exam?
- A. Exam P
 - B. Exam FM
 - C. Exam C
 - D. Exam A
53. What is the present value of a payment of \$1,000 in 5 years at an annual interest rate of 4%?
- A. \$820.08
 - B. \$943.40
 - C. \$1,000.00
 - D. \$1,215.51
54. In life insurance, what does the term “mortality rate” refer to?
- A. The probability of survival to a given age
 - B. The rate at which policyholders pay their premiums
 - C. The rate at which policyholders make claims
 - D. The rate at which policyholders cancel their policies
55. What is the formula for calculating the net present value (NPV) of a series of cash flows?
- A. $\sum_{t=1}^n \frac{CF_t}{(1+r)^t}$
 - B. $\sum_{t=1}^n CF_t \times (1+r)^t$
 - C. $\sum_{t=1}^n \frac{CF_t}{(1+r)^n}$
 - D. $\sum_{t=1}^n CF_t \times (1+r)^n$

56. What is the primary purpose of reserving in insurance?
- To ensure that there are enough funds to cover future claims
 - To maximize profits for the insurance company
 - To provide refunds to policyholders
 - To reduce the cost of premiums for policyholders
57. A company sells life insurance policies to individuals. The probability that a 40-year-old male will survive to age 65 is 0.85. What is the probability that out of 10 randomly selected 40-year-old males, exactly 8 will survive to age 65?
- $\binom{10}{8} \times (0.85)^8 \times (0.15)^2$
 - $\binom{10}{8} \times (0.85)^8 \times (0.15)^8$
 - $\binom{10}{8} \times (0.85)^8 \times (0.15)^{10}$
 - $\binom{10}{8} \times (0.85)^{10} \times (0.15)^8$
58. What is the difference between reinsurance and retrocession?
- Reinsurance involves transferring part of the risk to another insurer, while retrocession involves transferring part of the risk back to the original insurer
 - Reinsurance involves insuring against losses from catastrophic events, while retrocession involves insuring against individual policyholder claims
 - Reinsurance is purchased by the policyholder, while retrocession is purchased by the insurer
 - Reinsurance is used in property insurance, while retrocession is used in life insurance
59. Which of the following is a characteristic of an annuity?
- A series of equal periodic payments
 - A lump sum payment
 - Payments that vary based on investment performance
 - Payments that only occur at the end of the annuity period
60. What is the formula for calculating the future value of an annuity?
- $FV = P \times \left(\frac{(1+r)^n - 1}{r} \right)$
 - $FV = P \times (1+r)^n$
 - $FV = P \times \left(\frac{(1+r)^n}{r} \right)$
 - $FV = P \times \left(\frac{r}{(1+r)^n - 1} \right)$

61. What type of insurance provides coverage for crops and livestock?
- A. Motor insurance
 - B. Health insurance
 - C. Agriculture insurance
 - D. Life insurance
62. Which of the following perils is typically covered by agriculture insurance?
- A. Vehicle theft
 - B. Crop failure due to drought
 - C. Medical expenses due to illness
 - D. Legal liabilities
63. What is the purpose of motor insurance?
- A. To provide coverage for damage to agricultural equipment
 - B. To provide coverage for vehicles against accidents and theft
 - C. To provide coverage for medical expenses related to motor accidents
 - D. To provide coverage for loss of income due to disability
64. Which of the following is NOT typically covered under motor insurance?
- A. Third-party liability
 - B. Theft of the insured vehicle
 - C. Personal accident cover for the driver
 - D. Loss of crops due to natural disasters
65. What does TP in “TP insurance” stand for in the context of motor insurance?
- A. Third-party
 - B. Total premium
 - C. Theft protection
 - D. Temporary policy
66. In agriculture insurance, what is a deductible?
- A. The amount the insured pays out of pocket before the insurance coverage kicks in
 - B. The total coverage provided by the insurance policy
 - C. The premium paid by the insured to the insurer
 - D. The duration of the insurance policy

67. Which of the following is an example of a motor insurance add-on cover?
- A. Personal accident cover
 - B. Third-party liability cover
 - C. Basic own damage cover
 - D. Critical illness cover
68. What is the maximum tenure for a motor insurance policy in India?
- A. 1 year
 - B. 3 years
 - C. 5 years
 - D. 10 years
69. Which organization administers the Pradhan Mantri Fiscal Bima Yojana (PMFBY) in India?
- A. Insurance Regulatory and Development Authority of India (IRDAI)
 - B. National Agricultural Insurance Scheme (NAIS)
 - C. Agriculture Insurance Company of India Limited (AIC)
 - D. Ministry of Agriculture and Farmers Welfare
70. What is the purpose of the National Crop Insurance Programme (NCIP) in India?
- A. To provide financial assistance to farmers for crop production
 - B. To provide insurance coverage against crop loss due to natural calamities
 - C. To provide subsidies for agricultural machinery and equipment
 - D. To promote organic farming practices
71. What is the primary function of an actuary in an insurance company?
- A. To calculate premiums for insurance policies
 - B. To assess and manage risks associated with insurance policies
 - C. To handle customer service inquiries
 - D. To market and sell insurance products

72. What is adverse selection in insurance?
- A. The tendency for individuals with lower risk to seek out insurance coverage
 - B. The tendency for individuals with higher risk to seek out insurance coverage
 - C. The process of underwriting insurance policies
 - D. The process of setting insurance premiums
73. Which of the following statements about risk management in insurance is true?
- A. Risk management aims to eliminate all risks associated with insurance policies
 - B. Risk management involves identifying, assessing and mitigating risks to minimize their impact
 - C. Risk management is only relevant for life insurance, not other types of insurance
 - D. Risk management is the responsibility of policyholders, not insurance companies
74. What is the purpose of actuarial models in insurance?
- A. To predict future stock market trends
 - B. To calculate premiums for insurance policies
 - C. To assess and manage risks associated with insurance policies
 - D. To handle customer service inquiries
75. Which of the following is NOT a factor typically considered when setting insurance premiums?
- A. Age and gender of the policyholder
 - B. Occupation and income level of the policyholder
 - C. Marital status and number of dependents
 - D. Political affiliation of the policyholder

82. Which of the following is a major component of India's foreign exchange reserves?
- A. Gold
B. Oil
C. Wheat
D. Automobiles
83. What is the main objective of the Make in India initiative launched by the Government of India?
- A. To promote domestic manufacturing and attract foreign investment
B. To increase agricultural productivity
C. To reduce unemployment in the services sector
D. To improve infrastructure development in rural areas
84. What is the term used to describe a situation where the rate of inflation exceeds the rate of economic growth?
- A. Stagflation
B. Hyperinflation
C. Deflation
D. Disinflation
85. Which of the following sectors in the Indian economy has been traditionally characterized by a high level of informality?
- A. Agriculture
B. Manufacturing
C. Services
D. Information Technology
86. Who is known as the "Father of the Indian Constitution"?
- A. Mahatma Gandhi
B. Jawaharlal Nehru
C. B.R. Ambedkar
D. Sardar Vallabhbhai Patel
87. Which part of the Indian Constitution deals with fundamental Rights?
- A. Part II
B. Part III
C. Part IV
D. Part V

ANSWER SHEET

1	A	B	C	D	E	26	A	B	C	D	E	51	A	B	C	D	E	76	A	B	C	D	E
2	A	B	C	D	E	27	A	B	C	D	E	52	A	B	C	D	E	77	A	B	C	D	E
3	A	B	C	D	E	28	A	B	C	D	E	53	A	B	C	D	E	78	A	B	C	D	E
4	A	B	C	D	E	29	A	B	C	D	E	54	A	B	C	D	E	79	A	B	C	D	E
5	A	B	C	D	E	30	A	B	C	D	E	55	A	B	C	D	E	80	A	B	C	D	E
6	A	B	C	D	E	31	A	B	C	D	E	56	A	B	C	D	E	81	A	B	C	D	E
7	A	B	C	D	E	32	A	B	C	D	E	57	A	B	C	D	E	82	A	B	C	D	E
8	A	B	C	D	E	33	A	B	C	D	E	58	A	B	C	D	E	83	A	B	C	D	E
9	A	B	C	D	E	34	A	B	C	D	E	59	A	B	C	D	E	84	A	B	C	D	E
10	A	B	C	D	E	35	A	B	C	D	E	60	A	B	C	D	E	85	A	B	C	D	E
11	A	B	C	D	E	36	A	B	C	D	E	61	A	B	C	D	E	86	A	B	C	D	E
12	A	B	C	D	E	37	A	B	C	D	E	62	A	B	C	D	E	87	A	B	C	D	E
13	A	B	C	D	E	38	A	B	C	D	E	63	A	B	C	D	E	88	A	B	C	D	E
14	A	B	C	D	E	39	A	B	C	D	E	64	A	B	C	D	E	89	A	B	C	D	E
15	A	B	C	D	E	40	A	B	C	D	E	65	A	B	C	D	E	90	A	B	C	D	E
16	A	B	C	D	E	41	A	B	C	D	E	66	A	B	C	D	E	91	A	B	C	D	E
17	A	B	C	D	E	42	A	B	C	D	E	67	A	B	C	D	E	92	A	B	C	D	E
18	A	B	C	D	E	43	A	B	C	D	E	68	A	B	C	D	E	93	A	B	C	D	E
19	A	B	C	D	E	44	A	B	C	D	E	69	A	B	C	D	E	94	A	B	C	D	E
20	A	B	C	D	E	45	A	B	C	D	E	70	A	B	C	D	E	95	A	B	C	D	E
21	A	B	C	D	E	46	A	B	C	D	E	71	A	B	C	D	E	96	A	B	C	D	E
22	A	B	C	D	E	47	A	B	C	D	E	72	A	B	C	D	E	97	A	B	C	D	E
23	A	B	C	D	E	48	A	B	C	D	E	73	A	B	C	D	E	98	A	B	C	D	E
24	A	B	C	D	E	49	A	B	C	D	E	74	A	B	C	D	E	99	A	B	C	D	E
25	A	B	C	D	E	50	A	B	C	D	E	75	A	B	C	D	E	100	A	B	C	D	E

ROUGH WORK

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