Code No.	R – 2103

Entrance Examination for Admission to the P.G. Courses in the Teaching Departments, 2023

CSS

ACTUARIAL SCIENCE

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								

Choose appropriate answer from the options in the questions.

(100 × 1 = 100 marks)

1. Power set of empty or Null set has exactly ———————— subset.
   a) One
   b) Two
   c) Zero
   d) Three

DO NOT WRITE HERE

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2. Which among the following can be taken as the discrete object?

   a) People
   b) Rational numbers
   c) Integers
   d) All the above

3. The rank of the following matrix is:

$$\begin{pmatrix} 1 & 3 & 0 & 0 \\ 0 & 4 & 1 & 0 \\ 0 & 5 & 0 & 1 \end{pmatrix}$$

   a) 2
   b) 4
   c) 3
   d) 1

4. If the sum of two-unit vectors is a unit vector, the magnitude of their difference is

a) 1/2 b) 3

c) 2 d) $\sqrt{3}$

5. The value of the following equation is

$\left(\sqrt{3}+1\right)^5-\left(\sqrt{3}-1\right)^5$

a) $68\sqrt{3}$ b) 152

c) $76+34\sqrt{3}$ d) 76

6. Let f and g be real functions such that $f(x)=x2+4$ and $g(x)=xx-2:x\neq 2$. The value of $f\circ g(3)$ is

a) 13 b) 12

c) 4 d) 5

7. If $\log_m 7-3\log_m 2=2$, then m is equal to

a) $\frac{7}{8}$ b) $-\frac{7}{8}$

c) $-\sqrt{\frac{7}{8}}$ d) $\sqrt{\frac{7}{8}}$

8. If $\sin\theta$ and $\cos\theta$ are the roots of the equation $ax2+bx+1=0$, then a relationship between a and b is

a) $b^2-a^2=2a$ b) $b^2+a^2=2a$

c) $b^2-a^2=2b$ d) $b^2+a^2=2b$

9. Classify the following deferential equation :

$$x\frac{d^3y}{dx^3} - \left(\frac{dy}{dx}\right)^4 + y = 0$$

a) 3rd-order, linear
b) 3rd-order, non-linear
c) 4th-order, linear
d) 4th-order, non-linear

10. Let $a_1, a_2, \ldots a_n, \ldots$ be defined by $a_n = 3 + 4n$. The sum of the first 15 terms is

a) 625
b) 635
c) 525
d) 555

11. The value of the integral given below is equal to

$$\int_{-1}^{1} x^{15} \cos^6 x \, dx$$

a) 1
b) 0
c) 3
d) 2

12. If $x^3 + 6x^2 + 4x + k$ is exactly divisible by $x + 2$, then $k =$

a) –6
b) –7
c) –8
d) –10

13. If $x^{140} + 2x^{151} + k$ is divisible by $x + 1$, then the value of k is

a) 1
b) –3
c) 2
d) –2

14. The eigen values of skew-symmetric matrix are

a) Always zero
b) Always pure imaginary
c) Either zero or pure imaginary
d) Always real

15. The rank of a 3×3 matrix $C(=AB)$, found by multiplying a non-zero column matrix A of size 3×1 and a non-zero row matrix B of size 1×3 is

a) 0 b) 1

c) 2 d) 3

16. In the following matrix, the rank of the matrix is

$$[A]=\begin{bmatrix}4 & 2 & 1 & 3\\ 6 & 3 & 4 & 7\\ 2 & 1 & 0 & 1\end{bmatrix}$$

a) 4 b) 3

c) 2 d) 1

17. In a vector field, the divergence of the gradient is

a) Curl b) Unity

c) Laplacian d) Zero

18. The Fourier Transform of a real valued time signal has

a) Odd symmetry b) Even symmetry

c) Conjugate symmetry d) Real

19. A set of linear equations is represented by the matrix equation $ax=b$. The necessary condition for the existence of a solution for this system is

a) a must be invertible

b) b must be linearly depended on the columns of A

c) b must be linearly independent on the columns of A

d) None of these

20. The number of positive integer *n* such that $\varphi(n)=11$ is

a) 8 b) 6

c) 0 d) 1

21. At $x=\frac{5\pi}{6}, f(x)=2\sin 3x+3\cos 3x$ is

a) Maximum b) Minimum

c) Zero d) Neither maximum nor minimum

22. Every even integer is also

a) Natural number b) Rational number

c) Irrational number d) Whole number

23. Zeros of analytic function are

a) Zero b) Isolated

c) Non-isolated d) None of these

24. The sum of the roots of the quadratic equation $x2-3x=0$ is

a) 1 b) 0

c) –3 d) 3

25. The real and imaginary part of an analytical function are always

a) Non-harmonic b) Harmonic

c) Non-continuous d) Not differentiable

26. For a group of 300 candidates, the mean of scores was found to be 50. Later it was discovered that the scores 84 and 53 were misread as 48 and 35, respectively. The correct mean is

a) 50.14 b) 50.18

c) 50.22 d) 50.24

27. A pair of fair dice is thrown. If the two numbers appearing are different, the probability that the sum is 4 or less is

a) 2/15 b) 1/15

c) 4/15 d) 7/15

28. Determine the mode of the decision received seven days in a row : 11, 13, 13, 17, 19, 23, 25.

a) 11 b) 17

c) 13 d) 23

29. The mean and variance of a normal random variable X are 40 and 16 respectively. Then $P(X < 46)$ is

a) 0.4938 b) 0.9332

c) 0.5062 d) 0.0668

30. The arithmetic means of the 4 consecutive integers starting with *x* is *y*. What is the arithmetic mean of 8 consecutive integers that start with *x* + 2?

a) $Y + 1$ b) $Y + 2$

c) $Y + 3$ d) $Y + 4$

31. A local drugstore owner knows that, on average, people enter his store at the rate of five per hour. Assuming that number of people entering in a given 3-minute period follows a Poisson distribution, find the probability that nobody enters the store during this period.

a) $e^{1/12}$ b) $e^{-3/5}$

c) $e^{-1/20}$ d) $e^{-1/4}$

32. The sum of deviations of 20 observations measured from 30 is – 20. The mean of the observations is

a) 20 b) 29

c) 30 d) 21

33. The numbers –1, 0, 3, x, x + 2, 9, 12, 13 are in ascending order. If the median of the numbers is 6, the arithmetic mean of the numbers is

a) 5 b) 5.5

c) 6 d) 6.5

34. The standard deviation and coefficient of variation of a set of observations are 5.2 and 10.4%, respectively. If each observation is increased by 2, then the coefficient of variation of new observations is

a) 10% b) 20%

c) 12.4% d) 10.4%

35. For a symmetrical distribution first quartile and median are respectively 20 and 24. The third quartile of the distribution is

a) 28 b) 26

c) 32 d) 22

36. The Standard Deviation for two observations is

a) Square of their difference

b) Half of their absolute difference

c) Their absolute difference

d) Twice of their absolute difference

37. The regression equation of y on x is $3x-5y=-12$ and regression equation of x on y is $2x-y=7$. The value of y when x = 10 is

a) 8.4 b) 6.5

c) 7 d) 9

38. In a class of 56 students, 28 opted for Mathematics, 30 opted for Biology and 22 opted for both Mathematics and Biology. If one of these students is selected at random, then probability that the student has opted neither Mathematics nor Biology is

a) 9/14 b) 5/14

c) 3/28 d) 1/7

39. The correlation coefficient between X and Y is 0.6. If $\sigma_X=1.5, \sigma_Y=2. X=10$, and $\overline{Y}$, then the regression of Z = 10 Y + 5 on X is :

a) $Z-20=0.8(X-10)$ b) $X-10=0.8(Z-20)$

c) $Z-205=0.45(X-10)$ d) $Z-205=8(X-10)$

40. The value of k for the function given below the probability density function is

$$f(x)=\begin{cases}\min\{x,(k-x)\} & \text{if } 0<x<2\\ 0 & \text{otherwise}\end{cases}$$

a) 1 b) 2

c) 3 d) 4

41. When $Var(x)=2.25$, $Var(y)=1$ and $Cov(x,y)=0.9$, then correlation coefficient is

a) 0.45 b) 0.8

c) 0.6 d) 0.75

42. What is the difference between correlation and causation?

a) There is no difference

b) Both are same

c) Correlation refers to a cause-and-effect relationship between two variables, while causation refers to a relationship between two variables

d) Causation refers to a cause-and-effect relationship between two variables, while correlation refers to a relationship between two variables

43. If the standard deviation of a set of numbers is 0, what can you say about the set of numbers?

a) All the values in the sample are identical

b) There is only one number in the set

c) The set of numbers has a very large range

d) The set of numbers is empty

44. Suppose X follows uniform distribution with the probability density function

$$f(x)=\begin{cases}\frac{1}{20}, & 10 \le x \le 30,\\ 0, & \text{otherwise}\end{cases}$$ Then the interquartile range of the distribution is

a) 5 b) 10

c) 15 d) 20

45. Which of the following statements is true?

a) If each observation is multiplied by a constant *k*, the inter-quartile range of the new observations does not change

b) For positively skewed distribution mean> median > mode

c) For positively skewed distribution, the frequency curve has the longer tail towards the left

d) For negatively skewed distribution, frequency curve has longer tail toward the right

46. A random variable X takes values 0, 1, 2, 3 and its mean is 1.8. If $P(X=3)=2P(X=1)$ and $P(X=2)=0.2$, then $P(X=0)$ is

a) 0.10 b) 0.15

c) 0.20 d) 0.30

47. When a research problem is related to heterogenous population, the most suitable sampling method is

a) Cluster sampling b) Stratified sampling

c) Convenient sampling d) Random sampling

48. A sample frame is

a) A summary of the various stages involved in designing a survey

b) An outline view of all the main clusters of unite in a sample

c) A list of all the main units in the population from which a sample will be selected

d) A wooden frame used to display tables of random numbers

49. The number of permutations of 10 distinct objects taken 5 at a time in which 3 particular objects occur together is

a) 756 b) 378

c) 126 d) 2016

50. A man is known to speak truth 80% of the times. He throws a die and reports that the number appeared is greater than 4. The probability that it is actually a number greater than 4 is

a) 4/5 b) 2/5

c) 2/3 d) 4/7

51. An investor deposits £10,000 in a bank account that pays simple interest at a rate of 5% pa. Calculate the accumulated value of the deposit after 3 years.

a) £ 9,500 b) £ 11,500

c) £10,000 d) £10,500

52. An investor deposits £5,000 into a savings account that pays 10% simple interest at the end of each year. Compare how much the investor would have after 6 years if the money were invested for 6 years

a) £8,000 b) £8,500

c) £6,500 d) £6,000

53. An investor deposits £10,000 in a bank account that pays compound interest at a rate of 5% pa. Calculate the accumulated value of the deposit after 3 years

a) £10,576.50 b) £11,576.50

c) £11,570.25 d) £11,576.25

54. An 8-month loan is repayable by a single payment of £100.000. If the loan is issued at a rate of commercial discount of 15% pa, calculate how much is initially lent to the borrower

a) £40,000 b) £60,000

c) £90,000 d) £80,000

55. Calculate the present value of £ 10,000 due at time 3 years, using a compound discount rate of 5% pa.

a) £8,573.75 b) £8,500.25

c) £9,573.75 d) £8,573.50

56. A type I error occurs when we

a) Reject a false null hypothesis

b) Reject a true null hypothesis

c) Do not reject a false null hypothesis

d) Do not reject a true null hypothesis

57. Reliability of a test does NOT imply

a) Validity b) Reproducibility

c) Consistency d) Repeatability

58. Parameters are those constants which occur in

a) Samples

b) Probability density functions

c) A formula

d) None of these

59. Most of the Non-Parametric methods utilize measurements on

a) Internal scale

b) Ratio scale

c) Ordinal scale

d) Nominal scale

60. Which one of the following will shift the supply curve for Good X to the right?

a) A government subsidy on the production of Good X

b) A decrease in labour productivity in industry X

c) A rise in the price of raw materials used to produce Good X

d) An increase in real wages in industry X

61. Which of the following is NOT a way to reduce inflation?

a) Slowing the rate of growth of the money supply

b) Tight controls on prices and incomes through prices and incomes policies

c) Devaluing the domestic currency

d) Keeping the domestic currency at a fixed exchange rate with respect to the currency of a low inflation economy

62. Which kind of policies are not entitled to bonuses?

a) Non-participatory

b) Money back

c) Children's policy

d) Whole life

63. All the following is true regarding ULIP'S except

a) Unit holder can choose between different kind of funds

b) Life insurer provides guarantee for unit values

c) Units may be purchased by payment of a single premium or via regular premium payments

d) ULIP policy structure is transparent with regards to the insurance expenses component

64. What is the basic contingency associated with pensions?

a) Mortality

b) Morbidity

c) Post-retirement income security

d) Disability

65. In an ordinary annuity, payments are made are received ———————— of each period.

a) At the beginning

b) At the end

c) On maturity

d) Six months before expiry

66. If a hypothesis is rejected at the 0.025 level of significance, it

a) Must be rejected at any level

b) Must be rejected at the 0.01 level

c) Must not be rejected at the 0.01 level

d) May or may not be rejected at the 0.01 level

67. Which of the following is not a risk fit for insurance?

a) Early death

b) Early death in an accident

c) Disability

d) Natural wear and tear of an asset

68. The term ‘Assurance’ refers to

a) Motor insurance
b) Life insurance
c) Fire insurance
d) Health insurance

69. Which of the following is the predecessor of the IRDA Act, 1999?

a) The Insurance Act, 1938
b) The Life Insurance Corporation Act, 1956
c) The Marine Insurance Act, 1963
d) The Public Liability Insurance Act, 1991

70. What is the value of firm usually based on?

a) The value of debt and equity
b) The value of equity
c) The value of debt
d) The value of assets plus liabilities

71. Shareholders wealth increases with the increase in

a) EPS
b) Market value of the firm
c) Dividend and market value of the firm
d) Market price of the equity share

72. Corporate wealth maximization is the value maximization for

a) Equity shareholders
b) Shareholders
c) Employees
d) Debt capital owners

73. Which of the following valuation methods is based on “Going concern concept”?

a) Market value method
b) Liquidation method
c) Salvage value method
d) Book value method

74. The term ———————— can be used in a broad sense to describe all the policies, procedures, relationships and systems in place to oversee the legal operations of the enterprise.

a) Corporate strategy
b) Corporate oversight
c) Corporate policy
d) Corporate governance

75. All the following influence capital budgeting cash flows EXCEPT

a) Salvage value
b) Accelerated depreciation
c) Method of project financing
d) Tax rate changes

76. Capital budgeting is related to

a) Long term assets
b) Short time assets
c) Fixed assets
d) Alt the above

77. Present value takes

a) Compounding rate
b) Discounting rate
c) Inflation rate
d) Deflation rate

78. ———————— is also termed as group risk.

a) Fundamental
b) Static
c) Property
d) Liability

79. The danger of loss from the unforeseen circumstances in future refers to

a) Peril
b) Hazard
c) Damage
d) Risk

80. Which of the following is not the principle of insurance?

a) Profit maximization

b) Principle of utmost good faith

c) Principle of contribution

d) Causa proxima

81. What is the theme of the 'World No Tobacco Day 2022'?

a) Tobacco: A threat to our humanity

b) Tobacco: A threat to our environment

c) Tobacco: A threat to our health

d) Dangers of smoking

82. What is the theme of the 'World Day Against Child Labour 2022'?

a) Universal Social Protection to End Child Labour

b) Rehabilitation and Restoration

c) Importance of Education

d) Commitment to End Child Labour

83. Which of the following countries is not a part of SAARC?

a) India

b) Afghanistan

c) China

d) Nepal

84. Hydrogen produced from renewable sources such as wind and solar energy is called as?

a) White Hydrogen

b) Pink Hydrogen

c) Green Hydrogen

d) Clean Hydrogen

85. What is the main cause of the export surplus?

a) Stringent import policy

b) Development in national and international markets

c) The country's exports promotion value

d) None of the above

86. The correct term among the mentioned revolutions that properly corresponds to 'fertilizers' is?

a) Silver revolution

b) Golden revolution

c) Grey revolution

d) Pink revolution

87. Which among the below mentioned can be stated as the primary goal of ATAL Incubators?

a) To create creativity

b) To instil and grow the sense of entrepreneurship

c) To develop industries

d) To enhance product development and quality

88. An uncontrolled increase in Population rate of population explosion in a nation point towards

a) Increase birth rate and the elevated death count

b) Elevated birth rate and the decreased death count

c) Low birth count and increased death rate

d) Decrease birth rate and elevated death stats

89. Hepatitis A which is the most common cause of jaundice in young people is an infection of liver by

a) Bacteria
b) Virus
c) Amoeba
d) Protozoan

90. Which of these is NOT a product of a fuel cell?

a) Water
b) Electricity
c) Heat
d) None of the above

91. Which is the most abundant vitamin found in carrot?

a) Vitamin A
b) Vitamin B
c) Vitamin C
d) Vitamin D

92. A universal donor has the blood group of

a) A
b) B
c) AB
d) O

93. Rio Summit is associated with

a) Convention of biological diversity
b) Greenhouse gases
c) Ozone depletion
d) Wetlands

94. Which of the following is the principal greenhouse gas which is emitted as a result of human activities such as the burning of coal, oil, and natural gases?

a) Chlorofluorocarbons
b) Ozone
c) Carbon dioxide
d) Sulphur dioxide

95. Which of the following is responsible to measures the rate of global warming?
    a) Physicist
    b) Radiologist
    c) Climatologist
    d) Astrologers

96. Which of the following is an important heat-trapping gas?
    a) Nitrogen
    b) Hydrogen
    c) Carbon monoxide
    d) Carbon dioxide

97. The most important strategy for the conservation of biodiversity together with traditional human life is the establishment of
    a) Biosphere reserves
    b) Botanical gardens
    c) National parks
    d) Wildlife sanctuaries

98. The natural residence of every organism is known as
    a) Niche
    b) Habitat
    c) Biome
    d) Habit

99. A wide variety of living organisms is called
    a) Diversity
    b) Biome
    c) Habitat
    d) Biodiversity

100. A mutual relationship between two organisms, where both of them are benefitting from watching the other is called
    a) Parasitism
    b) Symbiosis
    c) Mutualism
    d) Food chain

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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