Code No.	J – 2265

Entrance Examination for Admission to the P.G. Courses in the Teaching Departments, 2020

CSS

ACTUARIAL SCIENCE

General Instructions

1. The Question Paper is having two Parts — Part 'A' Objective type (60%) & Part 'B' Descriptive type (40%).
2. Objective type questions which carry 1 mark each are to be (✓) 'tick marked' in the response sheets against the appropriate answers provided.
3. 8 questions are to be answered out of 12 questions carrying 5 marks each in Part 'B'.
4. **Negative marking** : 0.25 marks will be deducted for each wrong answer in Part 'A'.

Time : 2 Hours **Max. Marks : 100**

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

PART – A

(Objective Type)

Choose appropriate answer from the options in the questions. **One** mark **each**.

(60 × 1 = 60 marks)

1. If $f(x)=x+1$ and $g(x)=x^2$, then is $f_{\circ}\ g(3)=$

   a) 4 b) 10

   c) 16 d) 9

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2. If $A = \begin{bmatrix} 2 & 0 & 1 \end{bmatrix}$ then the rank of AA^T is

   a) 3 b) 0

   c) 1 d) 2

3. The values of x when the real functions $f(x) = 3x^2 - 1$ and $g(x) = x + 3$ are equal are

   a) $-1, \frac{-4}{3}$ b) $-1, \frac{4}{3}$

   c) $1, \frac{-4}{3}$ d) $1, \frac{4}{3}$

4. If $y = \tan^{-1} x$ then $\frac{dy}{dx}$ is equal to

a) $1 + x^2$ b) $1 - x^2$

c) $\frac{1}{1+x}$ d) $\frac{1}{1+x^2}$

5. The value of $\cos 135°$ is

a) $\frac{1}{\sqrt{2}}$ b) 1

c) $\frac{-1}{\sqrt{2}}$ d) $\frac{1}{2}$

6. If n is a positive integer, then $n(n+1)(2n+1)$ is

a) is a perfect square

b) is an odd numbers

c) is an integral multiple of 6

d) does not necessarily have any of the above properties

7. Suppose, $n(X)$ the number of elements in the set X is 60, $n(Y) = 80$, $n(X - Y) = 45$. Then $n(X \cup Y)$ is equal to

a) 125 b) 135

c) 120 d) 115

8. The characteristic roots of the matrix $\begin{matrix} 1 & 5 & 7 \\ 0 & 2 & 1 \\ 0 & 0 & 3 \end{matrix}$ are

a) 0, 2, 4 b) 1, 2, 3

c) 1, 0, 2 d) 1, 5, 7

9. The roots of the quadratic equation $2x^2 + x + 1 = 0$ are

a) Real valued and unequal

b) Complex valued and unequal

c) Real valued and unequal

d) Complex valued and unequal

10. The Maclaurin's series for $f(x) = \frac{1}{1+x}$, x real, is

a) $1 - x + x^2 - x^3 + \ldots$

b) $1 + x + x^2 + x^3 + \ldots$

c) $1 + x - x^2 + x^3 + \ldots$

d) $1 - x + 2x - 3x + \ldots$

11. If $x = r\cos\theta$ and $y = r\sin$, then $\frac{\partial r}{\partial x}$ is equal to

a) $\sin\theta$ b) $\cos\theta$

c) $\tan\theta$ d) $\cot\theta$

12. The system $6x + 9y = 4$, $2x + 3y = 5$ has

a) a unique solution b) more than two solutions

c) no solution d) exactly two solutions

13. If $f(x) = [x]$, the greatest integer function, then $f(x)$ is

a) continuous everywhere

b) continuous nowhere

c) continuous where x is integer

d) continuous where x is not integer

14. The natural domain of the real function defined by $f(X)=\sqrt{x-1}$ is

a) $[0, \infty]$ b) $[-\infty, \infty]$

c) $[1, \infty)$ d) $(-\infty, 1)$

15. The value of $(1+\sqrt{5})^3+(1-\sqrt{5})^3$ is

a) 150 b) 32

c) 152 d) 30

16. The standard deviation for the population of numbers

5 10 –12 17 –14 0 –6 is equal to

a) 9 b) 13

c) 11.5 d) 18

17. The events A and B are such that $P(A\cup B)=\frac{2}{3}$ and $P(A\cap B^c)=\frac{1}{3}$. Then $P(B)=$

a) 1 b) 1/9

c) 1/3 d) 0

18. Which of the following statements is not true?

a) The covariance between X and Y is zero implies the correlation coefficient is zero

b) The correlation coefficient between X and Y lies between –1 and +1

c) The correlation coefficient between X and Y is not affected by change of origin and scale

d) The covariance between X and Y is zero implies the random variables are independent

19. If $P(A)=0.8$, $P(B)=0.35$ and $P(A\cap B)=0.25$, then is equal to $P(A\cup B)=$

a) 0.9 b) 0

c) 1 d) 0.75

20. The arithmetic mean and geometric mean of two observations are 25 and 15 respectively. The two observations are

a) 25, 25 b) 0, 50

c) 45, 5 d) 20, 30

21. The variance of the first *n* natural numbers is

a) $(n+1)(2n+1)/6$ b) $n^2 - 1/12$

c) $2n(2n+3)/6$ d) $(n+1)^2 / 12$

22. Let *A* and *B* be subsets of the sample space *S*. Consider the following statements :

(i) *A* is independent of *S*

(ii) If *A* and *B* are independent then A^c and B^c are also independent

(iii) If *A* and *B* are independent then *A* and *B* are mutually exclusive

(iv) If *A* and A^c are independent, then $(A) = 0$ or 1. Of these four statement s

a) (i), (ii) and (iii) are correct

b) (i), (ii) and (iv) are correct

c) (ii), (iii) and (iv) are correct

d) All are correct

23. The mean and the variance of a binomial random variable are 8 and 6, respectively. Then the number of independent trials is

a) 24 b) 16

c) 32 d) None of these

24. Let *X* be an exponential random variable with mean 2. The coefficient of variation of *X* is

a) 1 b) 2

c) $\frac{1}{2}$ d) 4

25. A shipment of 10 television sets includes four that are defective. In how many ways can a hotel purchase four of these sets and receive at most two defective sets?

a) 195 b) 170

c) 90 d) 185

26. Suppose X follows the Poisson distribution with mean 3. Then $E\ [40 - 2X - X^2]$ is

a) 31 b) 22

c) 28 d) 25

27. Let A and B be two events with $P(A)=0.5$, $P(B)=0.3$ and $P(A\cap B)=0.1$. Then $P(A\cap B \mid A\cup B)$ is

a) 1/7 b) 1/5

c) 3/5 d) 1/9

28. The correlation coefficient between X and Y is 0.3. Then the correlation coefficient between –1.5 X and 2 Y + 3 is

a) –0.9 b) –0.3

c) 0.3 d) 0.9

29. If there exists only four letters *R, A, N, K* in an English dictionary, what will be the rank of the work '*RANK*' in that dictionary?

a) 20 b) 24

c) 23 d) 16

30. If A and B are two mutually exclusive events, then they cannot be independent, if

a) $P(A)=0$ and $P(B)\neq 0$ b) $P(A)=0$ and $P(A)=0$

c) $P(A)\neq 0$ and $P(B)\neq 0$ d) $P(A)\neq 0$ and $P(B)=0$

31. If the continuous random variable X is uniformly distributed over the interval $[a, 3a]$, then $E[X^2]$ is equal to

a) $13a^2/3$ b) $13a^3/3$

c) $26a^3/3$ d) $26a^2/3$

32. If x is the median of the integers {11, 13, 3, 9, 7, 19, 2, 3, 21, 17, x}, which of the following could possibly be the value of x?

a) 8 b) 10

c) 12 d) 14

33. The standard deviation of 10 obervations is 1.5. Suppose each observation is first multiplied by –4 and then added to 3. The standard deviation of the new observations is

a) 9 b) 1.5

c) 4.5 d) 6

34. Suppose has Z standard normal distribution. Then (Z^{17}) is

a) –1 b) 1

c) 0 d) None of the above

35. Four boys and 3 girls are to sit in a row. The probability that all the boys sit together and so do all the girls is

a) 144/5040 b) 288/5040

c) 24/5040 d) 1

36. A very large eco system on land having distinct type of vegetation and wildlife is called?

a) Ecology b) Biome

c) Biodiversity d) Biosphere reserve

37. Which of the following country has the highest biodiversity?

a) India
b) Brazil
c) Russia
d) South Africa

38. Which one of the following cause global warming?

a) Carbon dioxide
b) Oxygen
c) Nitrogen
d) Hydrogen

39. What happens when seasonal transmission of vector species due to climate change?

a) Increase the spread of diseases
b) Decreased the spread of diseases
c) Vector species itself die
d) Vector species do not spread disease

40. Which Ministry has undertaken the National Mission for a “Green India”?

a) Ministry of Rural Development
b) Ministry of Environment & Forest
c) Ministry of Earth Affairs
d) None of these

41. Which State reduced Government Employee’s retirement age from 60 years of 58 years?

a) Gujarat
b) Punjab
c) Rajasthan
d) Tamil Nadu

42. When is the Zero Discrimination Day observed?

a) 28 February
b) 1 March
c) 15 March
d) 2 April

43. What is the theme of the 2020 National Science Day?

a) Make in India : S & T driven innovations

b) Women in Science

c) Science for the People and the People for Science

d) Science and Technology for a Sustainable Future

44. Electric bulb filament is made up of

a) Copper

b) Aluminium

c) Lead

d) Tungsten

45. Which country for the first time has claimed to use the antibody test to track coronavirus infections?

a) China

b) India

c) Japan

d) Singapore

46. According to the Hurun Global Rich List 2020, the number of billionaires is the highest in which country?

a) India

b) Canada

c) China

d) USA

47. Which country is to host Commonwealth shooting, archery events in 2022?

a) Australia

b) India

c) Brunei

d) Cameroon

48. Which city has been accounted for the highest number of digital transactions in India in 2019?

a) Mumbai

b) New Delhi

c) Bangaluru

d) Pune

49. Which mobile phone company has collaborated with ISRO to use NavIC technology?

a) OnePlus
b) Nokia
c) Xiaomi
d) Apple

50. Which of the following is not a part of the digestive system?

a) Small Intestine
b) Rectum
c) Pharynx
d) Spleen

51. When the market's required rate of return for a particular bond is much less than its coupon rate, the bond is selling at

a) A premium
b) A discount
c) Cannot be determined without more information
d) Face Value

52. Interest rates and bond prices

a) Move in the same direction
b) Move in opposite directions
c) Sometimes move in the same direction, sometimes in opposite directions
d) Have no relationship with each other (i.e. they are independent)

53. Hari borrowed some money from his friend at simple interest of 6% per annum. He returned his friend Rs. 15,600. After how much time did Sam return the money if he borrowed Rs. 12,000?

a) 8 years
b) 2.5 years
c) 5 years
d) 3.5 years

54. Musthafa paid Rs. 9,600 as interest on a loan he took 5 years ago at 16% rate of simple interest. What was the amount he took as loan?

a) Rs. 16,400
b) Rs. 12,000
c) Rs. 12,500
d) Rs. 18,000

55. The Basis of risk is

a) Liability
b) Uncertainty
c) Possibility of loss
d) Insurance

56. Patents, Copyrights and Trademarks are

a) Current assets
b) Fixed assets
c) Intangible assets
d) Investments

57. The long term assets that have no physical existence but are rights that have value is known as

a) Current assets
b) Fixed assets
c) Intangible assets
d) Investments

58. Expand the term IFRS

a) Indian Financial Reporting Standards
b) Indian Financial Reporting Systems
c) International Financial Reporting Standards
d) International Financial Reporting Systems

59. Which of the following is the regulator of insurance sector in India?

a) RBI
b) AMFI
c) IRDA
d) SEBI

60. Largest Life Insurance Company in India is

a) The New India Assurance Company Limited
b) Life Insurance Corporation of India (LIC)
c) United India Insurance Company Limited
d) National Insurance Company Limited

ANSWER SHEET — PART – A

1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5	A	B	C	D	E
6	A	B	C	D	E
7	A	B	C	D	E
8	A	B	C	D	E
9	A	B	C	D	E
10	A	B	C	D	E
11	A	B	C	D	E
12	A	B	C	D	E
13	A	B	C	D	E
14	A	B	C	D	E
15	A	B	C	D	E
16	A	B	C	D	E
17	A	B	C	D	E
18	A	B	C	D	E
19	A	B	C	D	E
20	A	B	C	D	E

21	A	B	C	D	E
22	A	B	C	D	E
23	A	B	C	D	E
24	A	B	C	D	E
25	A	B	C	D	E
26	A	B	C	D	E
27	A	B	C	D	E
28	A	B	C	D	E
29	A	B	C	D	E
30	A	B	C	D	E
31	A	B	C	D	E
32	A	B	C	D	E
33	A	B	C	D	E
34	A	B	C	D	E
35	A	B	C	D	E
36	A	B	C	D	E
37	A	B	C	D	E
38	A	B	C	D	E
39	A	B	C	D	E
40	A	B	C	D	E

41	A	B	C	D	E
42	A	B	C	D	E
43	A	B	C	D	E
44	A	B	C	D	E
45	A	B	C	D	E
46	A	B	C	D	E
47	A	B	C	D	E
48	A	B	C	D	E
49	A	B	C	D	E
50	A	B	C	D	E
51	A	B	C	D	E
52	A	B	C	D	E
53	A	B	C	D	E
54	A	B	C	D	E
55	A	B	C	D	E
56	A	B	C	D	E
57	A	B	C	D	E
58	A	B	C	D	E
59	A	B	C	D	E
60	A	B	C	D	E

ACTUARIAL SCIENCE

PART – B

(Descriptive Type)

Answer **any eight** questions. **(8 × 5 = 40 Marks)**

1. Differentiate between compound and simple rate of interest.

2. What is central limit theorem?

3. Differentiate between general and life insurance.

4. What is an annuity?

5. Distinguish between Type I error and Type II error.

6. Define correlation coefficient.

7. State and prove Bayes theorem.

8. How climate change has adverse effect on insurance industry.

9. State law of demand.

10. State fundamental theorem of calculus.

11. If $C = \begin{matrix} 0 & 2 & 2 \\ 1 & 1 & 1 \\ 0 & 1 & 2 \end{matrix}$. Find C^{-1}.

12. What is GST?

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