APPLIED MATHEMATICS (Code-241)

Name of student		**Total Pages**	**7**
Class& Division	**XII**	**Max.Marks**	**40**
Roll Number		**Total Time**	**90 min**

General Instructions:

1This question paper contains three sections – A, B and C Each part is compulsory.

2. Section A has 20 MCQs, attempt any 16 out of 20

3. Section B has 20 MCQs, attempt any 16 out of 20

4. Section C has 10 MCQs, attempt any 8 out of 10

5. All Questions carry equal marks.

SECTION A

(In this section,attempt any 16 questions out of Questions 1-20)

1. (8×14) in 12 hours clock is

a) 4 O'clock b)8 O'clock c) 6 O'clock d)2 O'clock

2.The least positive integer x satisfying $28 \equiv x \pmod 6$ is

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

3.A man can row upstream at 10 km/hr and downstream at 18 km/hr. Man's rate in still water in km/hr is

a) 14 b) 4 c) 12 d)10

4.In what ratio must a grocer mix two varieties of pulses costing ₹85 per kg and ₹ 100 per kg respectively so as to get a mixture worth ₹ 92 per kg?

a) 7:8 b) 8:7 c) 5:7 d) 7:5

5.A pipe fills $\frac{3}{7}$ th part of a tank in 1 hour. The rest of the tank can be filled in

a) $\frac{7}{3}$ hours b) $\frac{7}{4}$ hours c) $\frac{4}{3}$ hours d) $\frac{3}{4}$ hours

6.Three partners A, B, C invest ₹ 26000, ₹34000 and ₹10000 respectively in a business. Out of a profit of ₹ 3500, B's share is:

a)₹ 1300 b) ₹1700 c)₹ 500 d)₹ 1500

7. In a race of 400 meters can, A can give B a start of 20 meters and C a start of 39 meters. How much start can B give to C in the same race ?

a) 20 meters b) 15 meters c) 18 meters d) 25 meters

8.If $x < 7$, then

a) $-x < -7$ b) $-x \leq -7$ c) $-x > -7$ d)$-x \geq -7$

9.The matrix A = $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ is:

a) identity matrix b) symmetric matrix

c) skew-symmetric matrix d) diagonal matrix

10.If A is an invertible matrix, then det (A^{-1}) is equal to:

a) det(A) b) $\frac{1}{\det(A)}$ c)1 d) none of these

11.If $x + y = 8$,then the maximum value of xy is :

a) 8 b) 16 c) 20 d) 24

12.The slope of the normal to the curve $x^2 + 3y + y^2 = 5$ at the point (1,1) is:

a) $\frac{-2}{5}$ b) $\frac{5}{2}$ c) $\frac{2}{5}$ d) $\frac{-5}{2}$

13. In a poisson distribution if mean is 2,then variance is:

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

14. What is the index number of the base period?

a) 100 b) 10 c) 1 d)1000

15.If X is normally distributed with mean 20 and standard deviation 4, then standard normal variable Z corresponding to X= 21 is:

a) 1.25 b) -1.25 c) -0.25 d) 0.25

16. The units digit in 6^{600} is:

a) 2 b) 4 c) 6 d) 8

17.If y= $Ae^{5x} + Be^{-5x}$, then $\frac{d^2y}{dx^2}$ is equal to:

a) 25 y b) 5 y c) -25y d) 15 y

18. If the probability that a student will graduate is 0.4, then the probability that out of 5 students 1 student will graduate is:

a) 0.2592 b) 0.07776 c) 0.9224 d) 0.01024

19.Let X~ N (μ , σ^2), then Z= $\frac{x-\mu}{\sigma}$ follows normal distribution with:

a) $\mu = 1, \sigma = 0$ b) $\mu = 1, \sigma = 1$ c) $\mu = 2, \sigma = 1$ d) $\mu = 0, \sigma = 1$

20.If A is a non-singular square matrix of order 3 such that A^2=A, then the value of $|A|$ is:

a) -3 b) 3 c) 9 d) 27

SECTION-B

(In this section attempt any 16 questions out of 21-40)

21.If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$, then value of x is :

a) 3 b) $\pm$ 3 c) $\pm$ 6 d) 6

22. If A and B are symmetric matrices of the same order , then AB-BA is a:
a) symmetric matrix b) skew-symmetric matrix c) null matrix
d) none of the above

23.If $|2x - 1| > 5$, then :
a) $x \in (-2, \infty)$ b) $x \in (-\infty, 3)$ c) $x \in (-\infty, -2)$ d) none of these

24.A man can row a boat in still water at 15 km/hr and speed of water current is 5 km/hr . The distance covered by the boat downstream in 24 minutes is:
a) 4 km b)8 km c) 6 km d) 16 km.

25.The ratio of investments of two partners A and B is 11:12 and the ratio of their profits is 2:3. If A invested the money for 8 months, then for how much time B invested the money?
A) 11 months b) 10 months c) 9 months d)5 months

26.A milkman mixed some water with milk to gain 25% by selling the mixture at the cost price. The ratio of water and milk respectively, is:

a) 5:4 b) 4:5 c) 1:5 d) 1:4

27.If the mean and variance of a binomial variate X are 2 and 1 respectively, then the probability that X takes a value greater than 1 is:

a) $\frac{2}{3}$ b) $\frac{4}{5}$ c) $\frac{11}{16}$ d) $\frac{15}{16}$

28. The points at which the tangents to the curve $y = x^3 - 12x + 18$ are parallel to X axis are:

a)(2 ,-2) , (-2,-34) b) (0,34) , (-2,0) c) (2,34) ,(-2,0) d) (2,2),(-2,34)

29.Find the expectation of the random variable X:

X	0	1	2	3
P(X)	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{2}{6}$	$\frac{1}{6}$

a) 0.5 b) 1.5 c) 2.5 d) 3.5

30.Fischer'sprice index number is the

a) A.M of Laspeyres and Paasche's

b) G.M of Laspeyres and Paasche's

c) Difference of Laspeyres and Paasche's

d) None of the above.

31. Assume the current time is 2.00pm. What will be the time (in a.m. or p.m.) after 65 hours?

a) 7 a.m b) 7 p.m c) 3 a.m d) 3 p.m

32.There is a leak at the bottom of a cistern. Due to this it takes 8 hours to fill the cistern. Had there not been a leak, it would take one hour less to fill the cistern. How much does it take for the leak to completely empty the cistern?

a) 48 hours b) 55 $\frac{1}{3}$ hours c) 56 hours d) 15 hours

33. If A is a square matrix such that $A^2 = A$, then $(I + A)^3 - 7A$ is equal to:

a) A b) I-A c) I d) 3A

34.-11(mod 6) is equal to :

a) 1 b) 2 c) 3 d) none of these

35. The mortality rate for a certain disease is 0.007. Using Poisson distribution, calculate the probability of two deaths in a group of 400 people. $(e^{-2.8} = 0.06)$

a) 0.1176 b) 0.4704 c) 0.2352 d) none of these

36.If A $= \begin{bmatrix} 0 & a & 1 \\ -1 & b & 1 \\ -1 & c & 0 \end{bmatrix}$ is a skew-symmetric matrix, then the value of $(a + b + c)^2$ is :

a) 1 b) 0 c) 4 d) none of these

37. In which of the technology matrix, Hawkins-Simon conditions are satisfied

a) $\begin{pmatrix} 0.2 & 0.9 \\ 0.8 & 0.1 \end{pmatrix}$ b) $\begin{pmatrix} 0.7 & 0.3 \\ 0.2 & 1.2 \end{pmatrix}$ c) $\begin{pmatrix} 1.02 & 0.5 \\ 0.6 & 0.8 \end{pmatrix}$ d) $\begin{pmatrix} 0.3 & 0.2 \\ 0.1 & 0.5 \end{pmatrix}$

38. The function y=$|x|$ is

a) neither differentiable nor continuous at x=0

b) differentiable and continuous at x=0

c) continuous but not differentiable at x=0

d) differentiable but not continuous at x=0

39.If x =t^2 , y =t^3 then $\frac{d^2y}{dx^2}$ =

a) $\frac{3}{2}$ b) $\frac{3}{4t}$ c) $\frac{3}{2t}$ d) $\frac{3t}{2}$

40.Which of the following index number satisfy the time reversal test?

a) Laspeyre's b) Paasche's c) Fisher's d) None of these

SECTION C

In this section, attempt any 8 questions out of 10 questions.

(Questions 46-50 are based on a case-study.)

41.The area under the standard normal curve which lie to the right of $z = -0.66$ is:

a) 1-F(0.66) b) F(0.66)-1 c)F(0.66) d) F(-0.66)

42. A coin is tossed n times. The probability of getting head atleast once is 0.8, then the least value of n is:
a) 2 b) 3 c) 4 d) 5

43.A container contains 70 litres of liquid. The liquid being too concentrated, 7 litres of liquid was taken out from this container and replaced by water. This process was repeated thrice to reduce the concentration of the liquid. The quantity of liquid (in litres) left in the container is:
a) 51.03 b)52.03 c)50.03 d) None of these

44.Two pipes A and B can fill a cistern in 10minutes and 15 minutes respectively. Pipe C can empty the full cistern in 5 minutes. Pipes A and B are kept open for 4 minutes and then outlet pipe C is also opened. The cistern is emptied by the outlet pipe C in:
a)24hours b) 20 hours c) 18 hours d) 30 hours

45.The least value of the function $f(x)=x^3-18x^2+96x$ in the interval [0,9] is:

a) 126 b) 135 c)160 d) 0

CASE STUDY

A factory owner wants to construct a tank with rectangular base and rectangular sides, open at the top, so that its depth is 2 m and capacity is 8 m^3. The building of the tank costs ₹ 280 per square metre for the base and ₹180 per square metre for the sides:

Based on the above information, answer the following questions:

46. If the length and the breadth of the rectangular base of the tank are x y metres respectively, then the relation between x and y is
(a) $x + y = 4$ (b) $x y = 4$ (c) $x y = 1$ (d) $x y + x + y = 4$

47. The cost of construction of the sides of the tank is
(a) ₹ 180(x + y) (b) ₹ 360 (x + y) (c) ₹ 720 (x + y) (d) ₹1120 (x + y)

48. If C (in ₹) is the cost of construction of the tank, then C as a function of x is
(a) C = 1120 + 720(x + 4/x)

(b) C = 720 + 1120(x + 4/x)

(c) C=1120+ 360(x + 4/x)

(d) C = 1120 + 180(x + 4/x)

49. The cost of construction of the tank is least when the value of
(a) 1 b) $\frac{3}{2}$ c) 2 d) 3

50. The least cost of construction of the tank is
(a)₹ 2000 (b) ₹ 3000 c) ₹ 3600 (d)₹ 4000

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