Class XI

FINAL EXAM (2020-21)

APPLIED MATHEMATICS

Time: 3 hrs. **M.M.80**

General Instructions:

This question paper contains two parts A and B. Each part is compulsory. Part A carries 24 marks and Part B carries 56 marks

Part – A:

1. It consists of two sections- I and II.
2. Section I comprises of 16 very short answer type questions.
3. Section II contains 2 case studies. Each case study comprises of 5 case-based MCQs. An examinee is to attempt any 4 out of 5 MCQs.

Part – B:

1. It consists of three sections- III, IV and V.
2. Section III comprises of 10 questions of 2 marks each.
3. Section IV comprises of 7 questions of 3 marks each.
4. Section V comprises of 3 questions of 5 marks each.
5. Attempt only one of the alternatives in all the questions wherever internal choices are provided.

PART A (Objective type questions)

Section I (1 mark questions)

1. Perform the following binary operation: **101101** divided by **101.**

2. Express each of the following as the logarithm of a single number:

$\frac{1}{2}$ **log 9 - 3 log 4 + 3 log 2**

4. Find the value of x in each of the following:

log (x + 3) + log (x - 3) = log 27.

4. Write the relation **R = {(x, y): 2x + 3y = 12}** defined on the set **{0, 1, 2,...., 10}** as the set of ordered pairs.

5. Check whether the relation R on R defined by $\mathbf{R = \{(a, b) : a \leq b^3\}}$ is reflexive or not.

6. In how many ways can the letters of the word **DELHI** be arranged so that the vowels occupy only even places?

7. Find the domain and range of the function **f (x)** = $\frac{x^2-9}{x-3}$.

8. A and B are two mutually exclusive events of an experiment. If

P (not A)= 0.65, P (A U B) = 0.65 and P (B) = p, find the value of p.

9. A ball is drawn from a bag containing **5** white and **7** black balls. If two balls are drawn simultaneously, what is the probability that both balls are white?

10. Events E and F are such that P (not E or not F) = **0.25**. State whether E and F are mutually exclusive or not.

11. In a certain code, **EAT** is written as **318** and **CHAIR** is written as **24156**. What will **TEACHER** be written as?

12. Differentiate the function **f(x) = $(2x^2+1)(3x+2)$** w.r.t. x.

13. Find the distance between the parallel lines **3x -4 y+ 9= 0** and **6 x - 8y -15= 0.**

14. Define Identity function. Write its domain and range. Draw its graph also.

15. If each of the observation $x_1, x_2, \ldots, x_n$ is increased by an amount 'a' where a is positive or negative number, then what will be the new variance?

16. For a certain frequency distribution $Q_1 = 58$, $Q_2 = 59$ and $Q_3 = 61$. Find the Bowley's coefficient of skewness.

SECTION II

Case –Study I. A shopkeeper buys an article whose printed price is **Rs. 4000** from a wholesaler at a discount of **20%** and sells the article to a

consumer at the printed price. It is given that the sales are intra-state and the rate of GST is **12%.**

Based on the above information, answer the following questions:

17. Find the price of the article inclusive of GST at which the shopkeeper bought it.

a) Rs. 3200 **b) Rs. 3392** **c) Rs. 3584** **d) Rs. 4192**

18. Find the amount of tax (under GST) paid by the shopkeeper to the State Government.

a) Rs. 240 **b) Rs. 192** **c) Rs. 384** **d) Rs. 48**

19. Find the amount of tax (under GST) received by the Central Government.

a) Rs. 240 **b) Rs. 192** **c) Rs. 96** **d) Rs. 48**

20. Find the amount of tax (under GST) paid by the consumer.

a) Rs. 240 **b) Rs. 192** **c) Rs. 384** **d) Rs. 480**

21. Find the amount paid by the consumer to buy the article.

a) Rs. 4240 **b) Rs. 4480** **c) Rs. 4384** **d) Rs. 4192**

Case –Study II. An insurance company insured **1500** scooter drivers, **2500** car drivers and **4500** truck drivers. The probability of a scooter, a car and a truck driver meeting with an accident is **0.01, 0.02 and 0.04** respectively.

Based on the above information, answer the following questions:

22. Find the probability that one of the insured persons meets with an accident.

a) **51/170** **b)1** **c) 49/170** **d) 49/1700**

23. If one of the insured persons meets with an accident, find the probability that he is a scooter driver.

a) 3/49 **b) 3/490** **c) 30/49** **d) 10/49**

24. If one of the insured persons meets with an accident, find the probability that he is a car driver.

a) 36/49 **b) 36/490** **c) 10/49** **d) 1/490**

25. If one of the insured persons meets with an accident, find the probability that he is a truck driver.

a) 36/49 **b) 36/490** **c)10/49** **d)1/490**

26. Find the probability that one of the insured persons does not meet with an accident.

a) 1651/1700 **b) 0** **c) 49/170** **d)121/170**

PART B (Descriptive type questions)

SECTION III

27. Out of **280** students in class XII of a school, **135** play hockey, **110** play football, **80** play volleyball, **35** of these play Hockey and football, **30** play volleyball and hockey, **20** play football and volleyball. Also each student plays at least one of the three games. How many students play all the three games?

28. How many numbers greater than a million can be formed with the digits **2, 3, 0, 3, 4, 2, 3?**

OR

Out of **18** points in a plane, no three are in the same straight line except **5** points which are collinear. How many straight lines can be formed by joining them?

29. Two trains 110m and 90 m long are running in opposite directions at 40 km/hr and 50 km /hr respectively. In what time will they cross each other completely from the moment they meet?

30. Find the value of k, if $\lim_{x\to 1} \frac{x^4-1}{x-1} = \lim_{x\to k} \frac{x^3-k^3}{x^2-k^2}$.

OR

Evaluate the following limit: $\lim_{x\to 0} \frac{e^x+e^{-x}-2}{x^2}$.

31. Find the value of **a** if the function f (x) defined by $f(x) = \begin{cases} 2x-1, & x<2 \\ a, & x=2 \\ x+1, & x>2 \end{cases}$

is continuous at **x =2.**

32. Find the equation of the line joining the point (-1,2) to the point of intersection of the lines **y-x +7=0** and **y + 2x -2=0.**

33. If A and B are two independent events with **P (A) = 0.3 and P(B) = 0.4,** then find **(i) P (A | B) and (ii) P (B | A).**

OR

In a class of **60** students, **30** opted for NCC, **32** opted for NSS and **24** opted for both NCC and NSS. If one of these students is selected at random find the probability that

i) the student has opted for NCC or NSS.

ii) the student has opted for neither NCC nor NSS.

34. Find the equation of the circle passing through **(0,0)** and which makes intercepts a and b on the coordinate axes.

35. What was the day on **15th August, 1947?**

36. Which of the two conclusions is / are true on the basis of given statements:

Statement I: All fruits are grapes.

Statement II: All mangoes are grapes.

Conclusion I: Some fruits are mangoes.

Conclusion II: Some grapes are mangoes.

SECTION IV

37. The volume of a cuboidal block of silver is **10368 cm^3**. If the dimensions are in the ratio **3:2:1**, find the dimensions of the block.

OR

A hollow sphere of internal and external radii **6 cm** and **8 cm** respectively is melted and recast into small cones of base radius **2 cm** and height **8 cm**. Find the number of cones formed.

38. The sum of first three terms of a G.P. is **16** and the sum of the next three terms is **128.** Find the sum of n terms of the G.P.

39. If **y log x = x-y,** prove that : $\frac{dy}{dx} = \frac{\log x}{(1+\log x)^2}$

OR

If $\mathbf{x}\sqrt{1+y} + \mathbf{y}\sqrt{1+x} = 0$, **x ≠y;** then prove that $\frac{dy}{dx} = \frac{-1}{(1+x)^2}$

40. Find Cov (X , Y) for the following data :

X	**3**	**4**	**5**	**6**	**7**
Y	**8**	**7**	**6**	**5**	**4**

OR

The mean and standard deviation of **6** observations are **8** and **4** respectively. If each observation is multiplied by **3**, find the new mean and new standard deviation of the resulting observations.

41. Determine the rate of interest per annum for a sum that becomes $\frac{729}{625}$ of itself in one year compounded half yearly.

42. Find the mean deviation about the median for the following data:

x_i	5	7	9	10	12	15
f_i	8	6	2	2	2	6

43. For any two statements, prove that the implication and its contrapositive are logically equivalent statements.

OR

Read the information given below and answer the questions that follow:
In a family, there are 6 members **P, Q, R, S, T and U**. Q is wife of P. S is the only son of R, who is the brother of P. T is sister of S. Q is the daughter-in -law of U, who is widow.

(i) How is U related to P?
(ii) How is T related to R?
(iii) How is R related to Q?
(iv) How is S related to U?

SECTION V

44. A bank pays **8%** interest per annum compounded half- yearly. What equal amount should be deposited at the end of each half-year for $\mathbf{1\frac{1}{2}}$ **years** to get an amount of **Rs 2000** at the end of **18** months?

OR

On a certain sum of money, the difference between the compound interest for a year, payable half- yearly, and the simple interest for a year is Rs 180. Find the sum lent out, if the rate of interest in both the cases is 10%.

45. In financial year 2019-20, Mrs. Sumita's (age **62** years) annual income was Rs.**7,58,000** (exclusive of HRA). She deposited Rs. **7500 per month** in GPF and Rs **23400 per half-year** in LIC. She purchased NSC worth **Rs25000** and donated Rs. **20000** in a charitable trust on which **50%** deduction is allowed under section 80G.Calculate the income tax Mrs. Sumita paid at the end of the financial year.

Income Tax Slab for FY 2019-20 (A.Y. 2020-21)
(For individual tax payers below the age of 60 years)

Taxable Income	Income Tax
Upto ₹ 2,50,000	NIL
₹ 2,50,001 to ₹ 5,00,000	5% of taxable income exceeding ₹ 2,50,000
₹ 5,00,001 to ₹ 10,00,000	₹ 12,500 + 20% of taxable income exceeding ₹ 5,00,000
Above ₹ 10,00,000	₹ 1,12,500 + 30% of taxable income exceeding ₹ 10,00,000

For individual tax payers (60 years old or more but less than 80 years)
(Senior Citizens)

Taxable Income	Income Tax
Upto ₹ 3,00,000	NIL
₹ 3,00,001 to ₹ 5,00,000	5% of taxable income exceeding ₹ 3,00,000
₹ 5,00,001 to ₹ 10,00,000	₹ 10,000 + 20% of taxable income exceeding ₹ 5,00,000
Above ₹ 10,00,000	₹ 1,10,000 + 30% of taxable income exceeding ₹ 10,00,000

46. The mean and Variance of 7 observations are **8** and **16** respectively. If five of the observations are **2, 4, 10, 12 and 14**, find the remaining two observations.

OR

Find Karl Pearson's coefficient of correlation between X and Y for the following data:

X	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Y	**14**	**17**	**18**	**19**	**20**	**24**	**28**