

APEEJAY SCHOOL COMMON ANNUAL EXAMINATION -2021-22  
SUBJECT – APPLIED MATHEMATICS (241), CLASS – XI

TIME – 2Hrs

M.M. – 40

General Instructions:

1. This question paper contains three sections- A, B and C. Each part is compulsory.
2. Section A has 6 questions of 2 marks each.
3. Section B has 4 questions of 3 marks each.
4. Section C has 4 questions of 4 marks each.
5. There is an internal choice of two questions of section A, one question of section B and one question of section C.
6. Question 14 is a case based problem having 2 sub parts of 2 marks each.

**Section A (2 marks each)**

1. At what rate percent compounded annually, a certain sum amount to 27 times of itself in 3 years?

OR

If the nominal rate is 5% compounded monthly, find the corresponding effective rate.

2. Eight children are to be seated on a bench.

- (i) In how many ways can the children be seated?
- (ii) How many arrangements are possible if the youngest child sits at the left hand side of the bench?

3. The probability that a contractor will get a plumbing contract is  $\frac{2}{3}$  and an electric contract is  $\frac{4}{9}$ . If the probability of getting at least one contract is  $\frac{4}{5}$ , find the probability that he will get both contracts.

OR

Probability of solving a specific problem independently by A and B are  $\frac{1}{2}$  and  $\frac{1}{3}$  respectively. If both try to solve the problem independently, then find the probability that

- (i) The problem is solved.
- (ii) Exactly one of them solves the problem.

4. If A and B are events such that  $P(A) = \frac{1}{2}$ ,  $P(B) = \frac{1}{3}$  and  $P(A \cap B) = \frac{1}{4}$  then, find  $P(A/B)$ .

5. Mr Ram lives in Kerala. He consumed 45 KL of water in one month. Calculate his water bill for that month. Water tariff plan is given below.

Unit of consumption( in KL)	Upto 8	8 to 25	25 to 50	>50
Price per unit( in ₹)	7	11	25	45

Minimum charges = ₹56 per month

Sewerage charges flat ₹14 for those whose consumption is upto 8 KL and 25% of water charges whose consumption is more than 8 KL.

6. Find the equation of parabola with focus at (0,4) and directrix  $y+4=0$ .

**Section B (3 marks each)**

7. If  $y = [x + \sqrt{x^2 + a^2}]^n$ , then prove that  $\frac{dy}{dx} = \frac{ny}{\sqrt{x^2 + a^2}}$

8. Find the value of k for which the function

$$f(x) = \begin{cases} \frac{x^2 - 2x - 3}{x + 1}, & x \neq -1 \\ k, & x = -1 \end{cases}$$

is continuous at  $x = -1$

9. A manufacturer marks an article at ₹5000. He sells it to a wholesaler at a discount of 25% on the marked price and the wholesaler sells it to a retailer at a discount of 15% on the marked price. The retailer sells it to a consumer at the marked price. If all the sale is intra state and the rate of GST is 12%, find:

- (i) The amount of tax (under GST) which the wholesaler pays to the Central Government.
- (ii) The amount of tax (under GST) which the retailer pays to the State Government.
- (iii) The amount inclusive of tax (under GST) which the retailer pays for the article.

10. Find the image of the point (1,2) in the line  $x - 3y + 4 = 0$ , assuming the line to be a plane mirror.

OR

The radius of the circle  $x^2 + y^2 - 2x + 3y + k = 0$  is  $2\frac{1}{2}$ . Find the value of k. Find also the equation of the diameter of the circle which passes through the point (5, 2.5).

**Section C (4 marks each)**

11. Calculate the net present value of a project which requires an initial investment of ₹ 200000 and it is expected to generate a net cash inflow of ₹ 80000 at every 6 months for 2 years. Assume that salvage value of project is zero and the discount rate is 12% per annum.

12. In financial year 2019-20, the annual income of Mr. Rohit (age 48 years) was ₹ 9,50,000 (exclusive of HRA). He deposited ₹ 9200 per month in NPS and ₹ 29,000 as LIC premium. He paid ₹ 4200 as tuition fee of his two children. He purchased a mediclaim policy of ₹ 18,400. He paid ₹ 1,09,000 as interest and ₹ 18,000 as principal on home loan. Calculate the interest paid by Mr. Rohit at the end of the financial year.

13. How many four letters words can be formed by using the letters of the word 'INEFFECTIVE'?

OR

In an examination, a question paper consists of 12 questions divided into two parts I and II, containing 5 and 7 questions respectively. A student is required to attempt 8 questions in all, selecting at least 3 from each part. In how many ways can a student select the questions?

14. A building contractor has under taken a building construction job. The probability that there will be a construction worker's strike 0.65. If there is a strike and still construction work will be completed on time, the probability is 0.32. The construction work will be completed on time in absence of any strike has the probability 0.80.

Based on the above information, answer the followings:

- (i) What is the probability that the construction job will be completed in time?
- (ii) What is the probability that there is a strike and construction work is completed in time?