Roll Number		

SET A

INDIAN SCHOOL MUSCAT
SECOND PRE-BOARD EXAMINATION
APPLIED MATHEMATICS (241)

CLASS: 12 TERM 2 Time Allotted: 2 Hrs.

09.04.2022 Max. Marks: 40

INSTRUCTIONS:

1. This question paper contains **three sections – A, B and C**. Each part is compulsory.
2. **Section - A** has 6 **short answer type (SA1) questions** of 2 marks each.
3. **Section – B** has 4 **short answer type (SA2) questions** of 3 marks each.
4. **Section - C** has 4 **long answer type questions (LA)** of 4 marks each.
5. There is an **internal choice** in some of the questions.
6. Q14 is a **case-based problem** having 2 sub parts of 2 marks each.

SECTION: A

1. Evaluate: $\int \frac{1}{x+x\,logx}\,dx$ 2

OR

The marginal cost function of a car manufacturing company is given by $MC = 7.5x^2 - 4x + 800$ where x is the quantity produced. Find the cost of producing 200 cars

2. At what rate converted semi-annually will the present value of a perpetuity of ₹ 450 payable at the end of each 6 months be ₹ 20,000? 2

OR

Suppose a person invested ₹15,000 in a mutual fund and the value of investment at the time of redemption was ₹25000. If CAGR for this investment is 8.88%. Calculate the number of years for which he has invested the amount?
(Given log 1.666 = 0.2216 and log 1.088 = 0.0369)

3. Explain the terms Simple Random Sampling and Systematic Random Sampling 2

4. Find difference in effective rate of interest equivalent to a nominal rate of 6% compounded 2
(i) Semi-annually (ii) Quarterly

5. A firm must transport at least 1200 packages daily using large vans which carry 200 packages each and small vans which can take 80 packages each. The cost for engaging each large van is ₹ 400 and each small van is ₹200. Not more than ₹ 3,000 is to be spent daily on the job and the number of large vans cannot exceed the number of small vans. 2

Formulate this problem as a LPP given that the objective is to minimize cost.

6. Discuss the four main components of time series 2

SECTION: B

7. The following table relates to the arrivals of migratory birds (in thousands) during 2006 to 2012 in a wetland: 3

Year	2006	2007	2008	2009	2010	2011	2012
Tourist arrivals	20	24	22	25	18	28	30

(i) Fit a straight-line trend by the method of least squares
(ii) Estimate the number of birds that would migrate in the year 2015.

OR

Compute the trends by the method of moving averages, assuming that 4-year cycle is present in the following series.

Year :	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Index number :	400	470	450	410	432	475	461	500	480	430

Represent the original and the smoothened data on the graph.

8. On 1st April, 2015, Dreams Ltd. purchased an AC for ₹ 3,00,000 and incurred ₹ 21,000 towards freight, ₹ 3,000 towards carriage and ₹ 6,000 towards installation charges. It has been estimated that the machinery will have a scrap value of ₹ 30,000 at the end of the useful life which is four years. 3
i) What will be the annual depreciation?
ii) Calculate the value of machinery after two years of its purchase, according to linear method.

9. Evaluate: $\int_0^1 \log(1 + 2x)\, dx$ 3

OR

If the supply function is $p = 4 - 5x + x^2$, find the producers' surplus when the price is 18.

10. The average heart rate for Indians is 72 beats/minute. To lower their heart rate, a group of 25 people participated in an aerobics exercise programme. The group was tested after six months to see if the group had significantly slowed their heart rate. The average heart rate for the group was 69 beats/minute with a standard deviation of 6.5. Was the aerobics program effective in lowering heart rate? 3

SECTION: C

11. Consider a bond with a coupon rate of 10% charged annually. The par value is ₹ 2,000 and the bond has 5 years to maturity. The yield to maturity is 11 %. What is the value of the bond? (Given $(1.11)^{-5} = 0.593451$) 4

OR

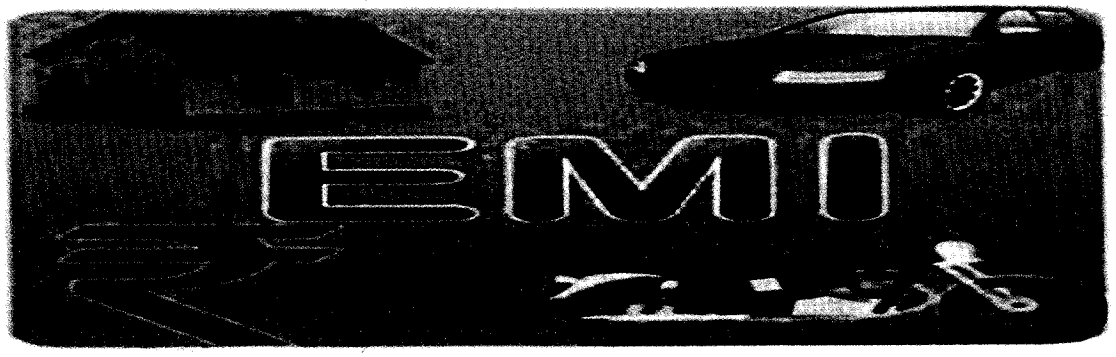
Mr X plans to save some amount for higher studies of his son, required after 10 years. He expects the cost of these studies to be ₹ 1,00,000. How much should he save at the beginning of each year to accumulate this amount at the end of 10 years, if the interest rate is 12% compounded annually? *Given* $(1.12)^{11} = 3.4785$

12. A manufacturer considers that men and women workers are equally efficient and so he pays them at the same rate. He has 30 and 17 units of workers and capital respectively, which he uses to produce two types of goods A and B. To produce one unit of A, 2 workers and 3 units of capital are required while 3 workers and 1 unit of capital is required to produce one unit of B. If A and B are priced at ₹100 and ₹ 120 per unit respectively, how should he use his resources to maximise the total revenue? Form the above as an LPP and solve graphically. 4

13. Gaurav deposited ₹ 5000 in an account paying 3% interest compounded continuously for 5 years. Using exponential growth model 4
i. Find the total amount at the end of 5 years.
ii. How long will it take for the money to double?

(Given $e^{0.15} = 1.1618$ and $\log 2 = 0.6931$)

14. **CASE-BASED /DATA-BASED** 4



EMI is the fixed amount payable monthly throughout the repayment period of a loan by the borrower to the lending institution. In other words, EMI (Equated Monthly Instalment) is like a normal form of loan repayment consisting of interest and principal. It depends on three factors namely:
1. The amount of loan taken,
2. The interest rate on the loan taken and
3. The loan tenure.

With this tool a borrower can know beforehand how much he has to repay each calendar instalment thus, forming a part of the budgeting exercise as well.
Mr. Manoj borrowed ₹ 10,00,000 from a bank to purchase a house and decided to repay by monthly equal instalments in 10 years. The bank charges interest at 9% compounded monthly. The bank calculated his EMI as ₹ 12,668.
Given $(1.0075)^{-108} = 0.4462$
i) Find the principal paid by the end of the first year?
ii) Find the interest paid by the end of the first year?