Roll Number		

SET A

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

CLASS: 12 TERM II Time Allotted: 2 Hrs.

02.03.2022 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: $\int x \log x \, dx$ 2

OR

The marginal cost function of a firm is given by $MC = 3000\, e^{0.3x} + 50$, where x is the quantity produced. If the fixed cost is ₹ 80,000, find the total cost of the firm.

2. How much money is needed to ensure a series of lectures costing ₹ 3,000 at the beginning of each year indefinitely if the money is worth 4 % compounded annually. 2

OR

M/s JBC Earthmovers was founded on April 1, 2018 by a RK Sharma. The revenue numbers for firm are as follows:

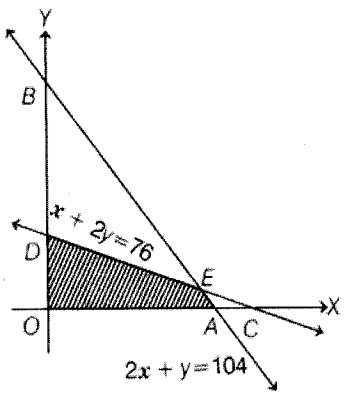
2018-2019	2019-2020	2020-2021
₹300000	₹ 250000	₹ 550000

Find the compound annual growth rate of the company.

3. A machine produces insulating washers for electrical devices of average thickness of 0.025 cm. A random sample of 10 washers was taken and have an average thickness of 0.024 cm with a standard deviation of 0.002 cm. Set up the null and the alternate hypothesis and calculate the t-value. 2

4. Discuss four main components of time series. 2

5. Find the corner points for the feasible region given below and minimize the objective function 3x + 2y. 2



6. A depositor is entitled to receive 9% p.a. as interest on the fixed deposit made with Punjab National bank. The bank credits the interest on fixed deposit account thrice a year. What is the effective rate of interest on fixed deposit? (Given $(1.03)^3 = 1.092727$) 2

SECTION:B

7. The following table relates to the tourist arrivals (in millions) during 2004 to 2010 in India: 3

Year	2004	2005	2006	2007	2008	2009	2010
Tourist arrivals	18	20	23	25	24	28	30

(i) Fit a straight-line trend by the method of least squares
(ii) Estimate the number of tourists that would arrive in the year 2014.

OR

The following table relates to the tourist arrivals (in millions) during 2004 to 2010 in India:

Year	2004	2005	2006	2007	2008	2009	2010
Tourist arrivals	18	20	23	25	24	28	30

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

8. An insurance company purchase an SUV for its employees. The original cost is ₹ 2,500,000. The SUV is sold after 5years for ₹ 1,000,000. Assuming linear depreciation, 3
(i) What is the annual depreciation?
(ii) What is the percentage rate of depreciation?
(iii) Find the book value of the SUV at the end of second year.

9. Evaluate: $\int \frac{2x+5}{(x+3)(x+4)} dx$ 3

OR

If the supply function for a particular commodity is given by $100p = (x + 20)^2$ and the market price is ₹ 25, find the producer's surplus.

10. Two types of drugs were used to control the high blood pressure on 6 and 8 patients and the decrease in systolic blood pressures (upper limit of *bp*) are as below: 3

Drug A (x)	12	18	30	15	7	14		
Drug B (y)	15	16	12	10	19	25	28	17

Is there any significant difference in the efficiency of drugs?

Given:

$\Sigma y_j = 144$ and $\Sigma(y_j - \bar{y})^2 = 272$	[illegible] = 6.91	$t_{12}(0.05) = 2.179$	

SECTION:C

11. A bond with face value of ₹ 1000 paying annual dividend at 4% will be redeemed at ₹ 1100 at the end of 10 years. Find the purchase price of this bond if investor wishes yield rate of 5 % per annum effective. (Given $(1.05)^{-10} = 0.6139$) 4

12. A Cooperative Society of farmers has 50 hectares of land to grow two crops X and Y. The profit from crops X and Y per hectare are estimated as ₹ 10,500 and ₹ 9,000 respectively. To control weeds, a liquor herbicide is to be used for crops X and Y at rate of 20 litres and 10 litres per hectare. Further, no more than 800 litres of herbicide should be used to protect fish and wildlife using a pond which collects drainage from this land. Formulate the above problem as linear programming problem and find out how much land should be allocated to each crop so as to maximize the total profit of the society? 4

13. DK Agrawal want to set up a sinking fund to have ₹ 400,000 after 10 years for his children's college education. How much amount should be set aside bi-annually into an account paying 5% per annum compounded half-yearly? (Given $(1.025)^{20} = 1.6386$) 4

OR

Find the equated monthly instalment of a loan of ₹ 2000000 per month for 15 years at 12% per annum compounded monthly. (Given $(1.01)^{-180} = 0.1668$)

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

Carbon 14, also known as radiocarbon, is radioactive form of carbon that is found in all living plants and animals. The radiocarbon disintegrates after the plant or animal dies. Scientists can find an estimate of age of the remains of plants and animals by comparing the amount of radiocarbon in it with those in living plants or animals. This technique is called carbon dating.

An archaeologist investigating the site of one of the largest burial grounds in India where the amount of carbon-14 present in individual remains is between 42% and 44% of the amount present in live individuals.

It's known that the half-life period of carbon-14 is nearly 5700 years.

(ii) Estimate the age of the village.

(ii)Estimate the length of time for which it survived.

End of the Question Paper