Subject Code - 241

Sample Question Paper <u>CLASS: XII</u> Session: 2021-22 Applied Mathematics (Code-241) Term - II

Time Allowed: 2 hrs

Maximum Marks: 40

General Instructions:

- The question paper is divided into 3 sections A, B and C
- Section A comprises of 6 questions of 2 marks each. Internal choice has been provided in two questions.
- Section B comprises of 4 questions of 3 marks each. Internal choice has been provided in one question.
- Section C comprises of 4 questions. It contains one case study based question. Internal choice has been provided in one question.

	<u>SECTION – A</u>					
1.	The marginal revenue function for a commodity is given by $MR = 9 + 2x - 6x^2$. Find the demand function.	2				
	OR					
	The marginal cost of producing x pairs of tennis shoes is given by					
	$MC = 50 + \frac{300}{x+1}$					
	If the fixed cost is ₹2000, find the total cost function.					
2.	Find the present value of perpetuity of ₹600 at end of each quarter if money is worth 8% compounded quarterly.	2				
3.	What effective rate is equivalent to a nominal rate of 8% per annum compounded quarterly?	2				
	OR					
	Find the present value of an annuity of ₹1000 payable at the end of each year for 5 years if money is worth 6%compounded annually.					
	$[Given (1.06)^{-5} = 0.7473]$					
4.	A sampling distribution of the sample means \overline{X} is formed from <i>a</i> population with mean weight $\mu = 60kg$ and standard deviation $\sigma = 9kg$. What is the expected value and standard deviation of \overline{X} , if sample size is 36?	2				
5.	Find the trend values using 3 yearly moving average for the loans sanctioned to farmers by a particular branch of a bank in a village.	2				

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	Year		2016	2017	2018	2019	2020	2021	
	Amount (i	n ₹ lakh)	25	30	32	40	45	50	
	The feasible	e region of	the LPP			1		1	2
	Min	Z = 3x + 2	у						
	subject to c	onstraints							
	$2x + y \ge 6$	$5, x - y \ge 0$	$0, x \ge 0, y$	$v \ge 0$ is Q	given belo	W:			
	¥↑								
	(0,6) R	N N N N N N N N N N N N N N N N N N N							
	1) the	N N N							
	P(2,2)	L L L							
	0	7	a.						
		Q (3,0)	→X						
	Determine t	the optimal	solution.	Justify yo	our answe	er.			
<u>SECTION – B</u>									
	quantity sup commodity	oplied at the is ₹48.	e price p.	Find the	producers	s surplus w	/hen the	price of the	
	The following table shows the quarterly sales (in ₹crore) of a real estate company. Compute the trend by quarterly moving averages.								
	Quar	ters	Q_1	Q_2		<i>Q</i> ₃	Q_4		
	Years								
	2018		12	14		18	20		
	2019		18	16		20	22		
	2020		27	24		30	36		
				O	R				
	Fit a straight line trend by the method of least squares and estimate the trend for the year 2023.								
	Year	2014	2015	2016	2017	2018	2019	2020	
	Sales (in ₹ lacs)	26	26	44	42	108	120	166	
	A machine machine is the mean th hypothesis	produces v in proper w nickness is at 5% level	vashers o vorking or 0.53mm of signifie	of thickne rder, a sa and the s cance tha	ss 0.50 m mple of 10 standard o t the mack	nm. To det 0 washers deviation is nine is wor	termine w is chose s 0.03 mr king in pr	whether the n for which m. Test the oper order.	3
		[Given o	critical v	alue, t _{0.02}	₅ = 2.262	at $v(d.f)$	= 9]		

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10.	A person invested ₹15000 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 time period for which the amount was invested?					
	$[Given \log(1.667) = 0.2219 \& \log(1.089) = 0.037]$					
	<u>SECTION – C</u>					
11.	S & D chemicals produces two products, an alkaline solution and a base oil that are sold as raw material to companies manufacturing soaps and detergents. On the basis of current inventory levels and estimated demand for the coming month, S & D's management has decided that combined production of alkaline solution and base oil must be at least 3500 gallons. S & D chemicals are also committed to supply 1250 gallons of alkaline solution to one of its major customer. The alkaline solution and base oil requires respectively 2 hours and 1 hour of processing time per gallon. The total processing time available for the coming month is 6000 hours. The production cost is ₹200 per gallon for the alkaline solution and ₹300 per gallon for base oil.	4				
	Formulate the above as a L.P.P and solve it by graphical method to help S & D chemicals determine the minimum production cost.					
12.	A machine costing ₹50,000 is to be replaced at the end of 10 years, when it will have a salvage value of ₹5000. In order to provide money at that time for a machine costing the same amount, a sinking fund is set up. If equal payments are placed in the fund at the end of each quarter and the fund earns 8% compounded quarterly, then what should each payment be?	4				
	$[Given (1.02)^{40} = 2.208]$					
13.	A couple wishes to purchase a house for ₹15,00,000 with a down payment of ₹4,00,000. If they can amortize the balance at an interest rate 9% per annum compounded monthly for 10 years, find the monthly installment (EMI) . Also find the total interest paid. [<i>Given</i> $(1.0075)^{-120} = 0.4079$]	4				
	OR					
	A ₹2000, 8% bond is redeemable at the end of 10 years at ₹105. Find the purchase price to yield 10% effective rate. [$Given(1.1)^{-10} = 0.3855$]					
14.						
	CASE STUDY					
	General anesthesia is used for major operations to cure the patients and conduct pain free surgeries. Propofol is a commonly used anesthetic injected for major operations such as knee replacement or open heart surgery. It also acts as a sedative and an analgesic.					

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