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OBCE/M-21 **26278**

BUSINESS MATHEMATICS-II

Paper–BC-205

Time : Three Hours] [Maximum Marks : 80

Note : Attempt *five* questions in all. Question No. 1 is compulsory.

1. Compulsory Question

(a) Find the compound interest on Rs. 2,400 for 2 years at 4% per annum. 4

(b) Find the amount of an ordinary annuity of 12 monthly payments of Rs. 1,000 that earn an interest at 12% per year compounded monthly. [Given $(1.01)^{12} = 1.127$] 4

(c) Find the local maximum and local minimum values of the function : $f(x) = x^3 - 6x^2 + 9x + 7$. 4

(d) Find the dual of the following LPP :

Minimize $Z = 3x + 5y$

Subject to the constraints

$3x + 2y \geq 6$, $4x + y \geq 4$, $14x + 6y \geq 5$, $x \geq 0$, $y \geq 0$. 4

(e) The demand law for a commodity is $p = 20 - 2x$. Find the consumer surplus when $x = 4$. 4

2. (a) Find the absolute maximum and absolute minimum values of the function $f(x) = 3x^4 - 2x^3 - 6x^2 + 6x + 1$ on the interval [0, 2]. 7½

(b) A manufacturer can sell petrol operated x items at a price of Rs. $\left(5 - \frac{x}{100}\right)$ each. The cost price of petrol operated x items is Rs. $\left(\frac{x}{5} + 500\right)$. Find the number of items he should sell to earn maximum profit. 7½

3. Solve the following linear programming problem graphically :

Minimize $Z = 2x + 3y$

Subject to constraints

$x + y \leq 4$, $3x + y \geq 4$, $x + 5y \geq 4$, $x \leq 3$, $y \leq 3$; $x, y \geq 0$. 15

4. A manufacturer produces two products 'A' and 'B'. Both the products are processed on two different machines. The available capacity of the first machine is 12 hrs and that of the second machine is 9 hrs. Each unit of product 'A' requires 3 hrs on both machines and each unit of product 'B' requires 2 hrs on first machine and 1 hr on the second machine. Each unit of product 'A' is sold at a profit of ₹ 5 and 'B' at a profit of ₹ 6. Find the production level for maximum profit graphically. 15

5. Solve the following LPP by Simplex Method :

Maximize $Z = 2x + 4y$

Subject to the constraints

$2x + 3y \leq 48$, $x + 3y \leq 42$, $x + y \leq 21$, $x \geq 0$, $y \geq 0$. 15

6. (a) A sum of money invested at compound interest amounts to ₹ 2,200 in one year and to ₹ 2,662 in three years. Find the principal and the rate percent. 7½

(b) A machine depreciates at the rate of 10% of its value at the beginning of the year. The machine was purchased for ₹ 10,000 and the scrap value realized when sold was ₹ 3,855. Find how many years the machine was used for ? 7½

7. (a) Find the present value of an annuity due of ₹ 1,000 per annum for 14 years allowing interest at 9% per annum. 7½

(b) A person has set up a sinking fund in order to have ₹ 1,00,000 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. 7½

8. (a) Find the consumer's surplus and producer's surplus under pure competition for demand function $p_d = \frac{8}{x+1} - 2$ and supply function $p_s = \frac{1}{2}(x+3)$, where p is price and x is the quantity. 7½

(b) Using integration, find the area of the region bounded by the line $2y = -x + 8$, x-axis, and the lines $x = 2$ and $x = 4$. 7½

9. For a two-sector economy with production sectors I and II, the intersectoral demand and final demand are as follows :

Producing Sector	Receiving Sector		Final Demand
	I	II	
I	176	308	150
II	352	102	200

(i) Find the total output of Sectors I and II.

(ii) Find the technical coefficients.

(iii) Find the matrix of technical coefficients.

(iv) Find the Leontief matrix.

(v) Verify Simons-Hawkins conditions for the viability of the system. 15