

BUSINESS MATHEMATICS

MAX. MARKS-80

BC-102

Time: 3 hrs

NOTE: Attempt five questions in all, selecting at least one question but not more than two from each unit.

UNIT-I

Q.1 (a) find the second derivatives of
 $y = \frac{x}{\sqrt{1-x^2}}$ —(8)

(b) Determine the local maximum and local minimum values for the function:

$$x^3 - 3x^2 - 9x - 7 \quad \text{---(8)}$$

Q.2 (a) if $x^p y^q = (x+y)^{p+q}$ then prove that

$$\frac{d^2 y}{dx^2} = 0 \quad \text{---(8)}$$

(b) find the local maximum and local minimum values, if any, of the function

$$y = \frac{x^4}{x-1}, \quad x \neq 1 \quad \text{---(8)}$$

Q.3 (a) Evaluate:

$$\int e^x \sin x \, dx \quad \text{---(8)}$$

(b) Evaluate:

$$\int \frac{8}{3x^3 + 7x^2 + 4x} \cdot dx \quad \text{---(8)}$$

UNIT-II

Q.4 (a) Prove that

$$\begin{vmatrix} 1 & x & x^3 \\ 1 & y & y^3 \\ 1 & z & z^3 \end{vmatrix} = (x-y)(y-z)(z-x)(x+y+z) \quad \text{---(8)}$$

Q.5 (b) if $A = \begin{bmatrix} 4 & 3 & 7 \\ 6 & 5 & -8 \\ 1 & 2 & 6 \end{bmatrix}$ express A as the sum of a symmetric and a skew-symmetric matrix — (8)

Q.5 (a) find the inverse of

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ 3 & 1 & 2 \end{bmatrix} \quad \text{--- (8)}$$

(b) show that $A = \begin{bmatrix} -8 & 5 \\ 2 & 4 \end{bmatrix}$ satisfy the equation $A^2 + 4A - 42I = 0$ and hence find A^{-1} — (8)

Q.6 (a) Solve the equations using Cramer's rule
 $2x + 3y = 5$
 $3x - 2y = 1$ — (8)

(b) Solve the equations using determinants
 $x + y + z = 6$
 $2x - y + z = 3$
 $x - 2y + 3z = 6$

UNIT - III

Q.7 (a) A small manufacturer has employed 5 skilled men and 10 semi-skilled men and makes an article in two qualities deluxe model and an ordinary model. The making of a deluxe model requires 2 hrs. works by a skilled man and 2 hrs work by semi-skilled man. The ordinary model required 1 hr. by a skilled man and 3 hrs. by a semi-skilled man.

By union rules, no man may work for more than 8 hrs per day. The manufacturer's clear profit on deluxe model is £15 and on an ordinary model is £10. How many of each type should be made in order to maximize his total daily profit.

Q.8 Maximize $Z = 3x + 5y$, subject to constraints
 using Simplex method

$$x + 2y \leq 20$$

$$x + y \leq 15$$

$$x \leq 5, \quad x, y \geq 0$$

Q.9 Find the compound interest on £1000 for 4 years at 5% per annum

(b) The present population of a town is 30,000 and it decreases at the rate 10% annually. What will be the population after 2 years?

Q.10 (a) Find the amount and present value of an annuity certain of £150 for 12 years reckoning interest at $3\frac{1}{2}\%$ p.a.

(b) A man borrows £6000 at 6% p.a. and promises to pay off the loan in 20 annual payments beginning at the end of the first year. What is the annual payment necessary.