6. Define L.P.P. Solve the following L.P.P using graphical method/ simplex method. 2+8=10

Max $Z = 8x_1 + 5x_2$

Subject to $x_1 \leq 150$

$x_2 \leq 250$

$2x_1 + x_2 \leq 500$

$x_1, x_2 \geq 0$

7. a) Find the dual of the following L.P.P. 4+6=10

Max $Z = 3x_1 + 2x_2 + 5x_3$

Subject to $x_1 + 2x_2 + x_3 \leq 430$

$3x_1 + 2x_2 \leq 460$

$x_1 + 4x_2 \leq 420$

$x_1, x_2 \geq 0$

b) Find the basic feasible solution of the following transportation using the North-West Corner method.

W_1	W_2	W_3	W_4	Supply ↓
10	0	20	11	20
12	7	9	20	25
0	14	16	18	15
10	15	15	20	← Demand

8. a) If $A = \begin{pmatrix} 1 & 2 & 0 \\ 3 & -1 & 4 \end{pmatrix}$, find AA^T and A^TA. 4+6=10

b) Determine the rank of the following matrices:

(i) $A = \begin{pmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{pmatrix}$ (ii) $B = \begin{pmatrix} 1 & 2 & 3 \\ 3 & 4 & 5 \\ 4 & 5 & 6 \end{pmatrix}$

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BACHELOR OF COMMERCE
SECOND SEMESTER (REPEAT)
BUSINESS MATHEMATICS
BCM-202

(Use separate answer scripts for Objective & Descriptive)

Duration : 3 hrs. **Full Marks : 70**

(PART-A : Objective)

Time : 20 min. **Marks : 20**

Choose the correct answer from the following: ***1X20=20***

1. Consider the following statement:
P: Convex set is always bounded.
Q: Circle is an example of convex set.
a. Only P is true. b. Only Q is true.
c. Both P and Q are true. d. Both P and Q are false.

2. Consider the following statement:
P: Feasible solution is always outside the feasible region.
Q: If the feasible region is unbounded then either maximum or minimum value of objective function can be determine.
a. Only P is true. b. Only Q is true.
c. Both P and Q are true. d. Both P and Q are false.

3. The dual of the following L.P.P
Max $Z = 2x_1 + 5x_2$
Subject to $x_1 + x_2 \leq 5$
$-x_1 + x_2 \leq 1$
$x_1, x_2 \geq 0$
has the following objective function
a. Max $Z = 5x_1 + x_2$ b. Min $Z = 5x_1 + x_2$
c. Min $Z = 2x_1 + 5x_2$ d. None of these.

4. Consider the following statement:
P: Dual of a dual is dual.
Q: If the primal has unbounded solution then the dual has infeasible solution.
a. Only P is true. b. Only Q is true.
c. Both P and Q are true. d. Both P and Q are false.

5. The formula to find compound interest is:
(P=Principal, r= Rate of C.I n= Number of years)
a. $P\left(1+\frac{r}{100}\right)^n$ b. $P\left(1+\frac{r}{100}\right)^n - P$
c. $P\left(1+\frac{n}{100}\right)^r - P$ d. $P\left(1+\frac{r}{100}\right)^n + P$

6. In what time will Rs.1250 amount to Rs. 1400 at 6% per annum?
a. 2 years b. 3 years
c. 4 years d. 5 years

7. For the general formula of simple interest $I = \frac{P n r}{100}$ gives:
a. $P = \frac{100\, I}{nr}$ b. $P = \frac{nr}{100I}$
c. $P = \frac{rI}{100\, n}$ d. $P = \frac{10\,0n}{rI}$

8. The minor of 4 in $\begin{vmatrix} 3 & -14 \\ 5 & 4 \end{vmatrix}$

a. 0 b. 3

c. -3 d. None of these

9. The value of $\lim_{x\to 0}(5x+4)$ is

a. 0 b. 2

c. 4 d. 6

10. The value of $\begin{vmatrix} 1 & 11 \\ -6 & 5 \end{vmatrix}$ is

a. 17 b. 19

c. 71 d. 91

11. If $f(x) = \frac{1-x}{1+x}$, then $f(\frac{1}{2})$

a. 1 b. $\frac{1}{2}$

c. $\frac{1}{3}$ d. None of these

12. The determinant of a unit matrix is

a. 0 b. 1

c. 2 d. 3

13. If a is the 1st term and d is the common difference of an A.P series, then the last term is

a. $a+nd$ b. $a+(n+1)d$

c. $a+(n-2)d$ d. $a+(n-1)d$

14. $\frac{d}{dx}(x^{n+1})$ is

a. 1 b. $(n+1)x^n$

c. $(n-1)x^{n-1}$ d. $(n+1)x$

15. The value of $1+2+3+\cdots..+n$ is

a. $\frac{n(n+1)}{2}$ b. $n(n+1)$

c. $\frac{n(n-1)}{2}$ d. None of these

16. A matrix A is said to be singular if the determinant of A is

a. 0 b. 1

c. 2 d. 3

17. The value of $\frac{d}{dx}(\log x)$ is

a. x b. $\frac{1}{x}$

c. $x-1$ d. None of these

18. If the roots of a quadratic equation $ax^2+bx+c=0$ are complex, then

a. $b^2-4ac>0$ b. $b^2-4ac=0$

c. $b^2-4ac<0$ d. None of these

19. The geometric mean of a and b is

a. $\frac{a+b}{2}$ b. $\sqrt{ab}$

c. $a-b$ d. None of these

20. A matrix whose number of rows and columns are equal is called

a. Null matrix b. Identity matrix

c. Non square matrix d. Square matrix

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(PART-B : Descriptive)

Time : 2 hrs. 40 min. **Marks : 50**

[Answer question no.1 & any four (4) from the rest]

1. a) Find the transpose and the adjoint of the matrix : 5+5=10

$$A = \begin{pmatrix} 3 & 1 & 2 \\ 2 & -3 & -1 \\ 1 & 2 & 1 \end{pmatrix}$$

b) Solve the following linear equations by matrix method.

$$3x+y+2z=3$$
$$2x-3y-z=-3$$
$$x+2y+z=4$$

2. a) The 5th and the 12th terms of an A.P series are 14 and 25 respectively. Find the first term and the common difference. 2+3+3+2=10

b) The sum of three numbers in A.P is 15 and their product is 80. Find the numbers.

c) The second term of a G.P series is 9 and the fifth term is 243. Find the fourth term of the series.

d) Find the eight and the tenth terms of the series 2, 4, 6, 8, 16.....

3. a) Define limit and continuity of a function. 2+4+4=10

b) Evaluate the following:

(i) $\lim_{x\to 3}\frac{x^3-27}{x-3}$ (ii) $\lim_{x\to -2}\frac{x^2+5x+6}{x^2-4}$

c) Find the continuity of the following functions at $x=1$

(i) $f(x) = \begin{cases} 1-x, & 0\le x\le 1 \\ x-1, & x>1 \end{cases}$

(ii) $f(x) = \begin{cases} -x, & x<0 \\ x, & 0\le x\le 1 \\ 2-x, & x>1 \end{cases}$

4. a) Solve : (i) $5x^2+5x-30=0$ (ii) $(x-7)(x-19)=64$ 4+2+4=10

b) If one root of $x^2-px+q=0$ is twice the other, then show that $2p^2=9q$.

c) Examine the nature of the following quadratic equations:

(i) $3x^2+2x-2=0$ (ii) $2x^2-5x+4=0$

5. a) The compound interest on a certain sum of money for two years is Rs. 920.25 and the simple interest is Rs. 900.00. Find the sum and the rate of interest. 6+4=10

b) Find the amount of an annuity consisting of payments of Rs. 800 at the end of every 3 months for 3 years at the rate of 8% compounded quarterly.