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COMMERCE

( Speciality )

( Mathematics )

( For Commerce )

Full Marks : 70

Pass Marks : 28

Time : 3 hours

*The figures in the margin indicate full marks  
for the questions*

1. (a) If  $2^x = 8^y = 16^z$  and  $xyz = 144$ , then  
show that

$$\frac{1}{2x} + \frac{1}{8y} + \frac{1}{16z} = \frac{3}{32} \quad 5$$

- (b) In an AP, the sum of first 50 terms is 200  
and the sum of next 50 terms is 2700.  
Find the common difference and the first  
term of the AP. 4
- (c) Find the point on the  $x$ -axis which is  
equidistant from the points (7, 6)  
and (3, 4). 3

(d) Find the equation of a straight line parallel to  $x$ -axis at a distance—

(i) 3 units above it;

(ii) 3 units below it.

2

Or

(e) If  ${}^n P_6 = 30 \cdot {}^n P_4$ , then find  $n$ .

3

(f) In how many ways a team of 11 players can be selected out of 15 if—

(i) one particular player must be there in each team;

(ii) one particular player is excluded from each team?

4

(g) Derive an equation of a straight line passing through two given points.

5

(h) Find the equation of the line passing through the point  $A(-2, 4)$  having slope equal to  $-\frac{4}{5}$ .

2

2. (a) (i) Define odd and even functions with examples.

$$1\frac{1}{2} + 1\frac{1}{2} = 3$$

(ii) If

$$f(x) = \frac{1}{1+x}$$

then find  $f\{f(x)\}$ .

2

(b) Find the value of—

(i)  $\lim_{x \rightarrow 1} \frac{x^2 - 1}{\sqrt{3x+1} - \sqrt{5x-1}}$ ;

(ii)  $\lim_{x \rightarrow \infty} \frac{3 - 2x^2}{3x + 5x^2}$ .

3+2=5

(c) Differentiate :

4

$$x^3 + y^3 - 3axy = 0$$

Or

(d) Show that  $f(x) = 5x + 4$  is continuous at  $x = 1$ .

2

(e) Find the value of—

(i)  $\int \frac{2ax + b}{ax^2 + bx + c} dx$ ;

(ii)  $\int_0^1 \frac{2x^3}{7} dx$ .

2+3=5

(f) If  $y = Ae^{mx} + Be^{-mx}$ , then show that

$$\frac{d^2y}{dx^2} - m^2y = 0 \quad \frac{d^2y}{dx^2} - m^2y = 0$$

3

(g) If  $u = (x^2 + y^2 + z^2)^{-1/2}$ , then show that

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = -u$$

4

3. (a) Distinguish between determinants and matrices. 2

(b) Construct  $2 \times 3$  matrix whose elements  $a_{ij}$  are given by

$$a_{ij} = \frac{(i+j)^2}{2} \quad 3$$

(c) If

$$A = \begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix} \text{ and } B = \begin{bmatrix} a & b \\ 3 & 5 \end{bmatrix}$$

then find  $a$  and  $b$  such that  $AB = BA$ . 4

(d) Prove that

$$\begin{vmatrix} 0 & c & b \\ -c & 0 & a \\ -b & -a & 0 \end{vmatrix} = 0 \quad 3$$

(e) If

$$A = \begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix} \text{ and } B = \begin{bmatrix} -1 & 4 \\ 0 & 3 \end{bmatrix}$$

then find  $3A + 2B$ . 2

Or

(f) Find the value of the determinant

$$\begin{vmatrix} 2 & 5 & 4 \\ 1 & 4 & 3 \\ 6 & 8 & 10 \end{vmatrix} \quad 3$$

(g) If

$$\begin{bmatrix} x-y & 2x+z \\ 2x-y & 3z+w \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$$

then find  $x$ ,  $y$ ,  $z$  and  $w$ .

3

(h) Find the inverse of

$$A = \begin{bmatrix} 1 & 0 & 2 \\ 2 & -1 & 3 \\ 4 & 1 & 8 \end{bmatrix}$$

5

(i) Solve :

3

$$\begin{bmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{bmatrix} = 0$$

4. (a) (i) Who first developed LPP? What are the basic assumptions of LPP? 1+3=4

(ii) Discuss the limitation of linear programming.

4

(b) Show graphically a situation when a linear programming problem—

(i) has no solution;

(ii) has an unbounded solution;

(iii) has multiple solutions.

6

Or

- (c) What is an LP problem? Discuss the scope and role of LP in solving business problem. 1+3=4

- (d) A manufacturer prepares two products A and B. The time of preparation, capacity available at each work centre and net revenue are given below :

Work centre/ product	Cutting (in hr)	Fabrication (in hr)	Assembly (in hr)	Net revenue per unit (in Rs)
A	1	4	2	150
B	2	5	3	180
Total capacity	500	1400	700	

Formulate the linear programming model. 5

- (e) What is a simplex? Write the steps used in the simplex method. 1+4=5

5. (a) (i) Find the value of

$$\log_2 [\log_2 \{ \log_3 (\log_3 27^3) \}] \quad 2$$

- (ii) If  $x^2 + y^2 = 6xy$ , then show that

$$2 \log(x+y) = 3 \log 2 + \log x + \log y \quad 3$$

(b) A man borrows Rs 12,500 at 5% p.a. CI and agrees to repay the loan with interest in 5 equal annual instalments, the first payment being made at the end of the first year. Find the amount of each payment, correct to nearest rupee. 5

(c) To endow a scholarship of Rs 4,500 per year, what sum should be set aside in a bank reckoning @ 9% compound interest per annum? 4

Or

(d) (i) If  $\log_{10} 2 = 0.30103$  and  $\log_{10} 7 = 0.84509$ , then find  $\log_7 \sqrt{2}$ . 2

(ii) Find the value of

$$\log \sqrt{\frac{3}{2}} - \log \sqrt{\frac{2}{3}} - \log \frac{3}{2} \quad 2$$

(e) A sum of money was lent out at compound interest for 2 years at 20% p.a. If interest is compounded half-yearly, then the compound interest received is Rs 482 more than in case interest is compounded annually. Find the sum. 5

- (f) A company sets aside a sum of Rs 10,000 annually to accumulate at 4% p.a. CI for 10 years to repay a debenture issue amounting to Rs 1,20,000. Find the surplus after paying of the debenture.

[Given,  $\log 1.04 = 0.01703$

antilog  $0.01703 = 1.4801$ ]

5

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