

B.Tech. - C.S.B.S. (Sem-I) Winter-2019

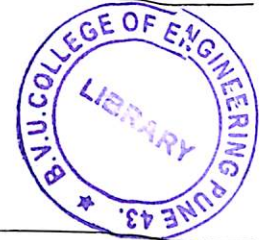
B. TECH. (COMPUTER SCIENCE & BUSINESS SYSTEMS) (CBCS - 2018  
COURSE) B.Tech. (CSBS) Sem - I: WINTER- 2019  
SUBJECT: MATHEMATICS-I (UE )

Monday 18-11-2019  
10:00 AM-01:00 PM

W-20420-2019  
Max. Marks: 60

N. B. :

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable calculator is **ALLOWED**.
- 4) Assume suitable data, if necessary.



Q. 1 Show that: (10)

$$\int_0^1 \int_x^{1/x} \frac{y dx dy}{(1+xy)^2 (1+y^2)} = \frac{\pi-1}{4}$$

OR

Q. 1 Integrate : (10)

$\iiint x^2 y z \, dx \, dy \, dz$  throughout the volume bounded by the planes  
 $x=0, y=0, z=0,$   
 $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1.$

Q. 2 Find by double integration the area between the curves (10)  
 $y^2 x = 4a^2 (2a - x)$  and its asymptote.

OR

Q. 2 Find the volume bounded by the cylinders  $y^2 = x, x^2 = y$  and the planes (10)  
 $z=0, x+y+z=2.$

Q. 3 Obtain the Disjunctive normal form of:

a)  $(p \rightarrow q) \wedge (\sim p \wedge q)$  (05)

b)  $\sim(p \rightarrow (q \wedge r))$  (05)

OR

Q. 3 Prove that  $(p \rightarrow (q \rightarrow r)) \Rightarrow ((p \rightarrow q) \rightarrow (p \rightarrow r))$  (10)

P. T. O.

Q. 4 a) Reduce the expression  $\overline{XY} + \overline{X} + XY$ . (05)

b) Minimize  $AB + \overline{AC} + A\overline{B}C (AB + C)$  (05)

OR

Q. 4 a) Minimize the following function using a karnaugh map (05)

$$F(W, X, Y, Z) = \sum(0, 4, 8, 12)$$

b) Reduce: (05)

$$F(A, B, C, D) = \sum(0, 2, 7, 8, 10, 15) \text{ using k-map.}$$

Q. 5 Let  $z_n$  denote the set of integers  $\{0, 1, 2, \dots, n-1\}$ .

Let  $*$  be binary operation on  $z_n$  such that,

$a * b =$  the remainder of  $ab$  divided by  $n$ .

a) Construct the table for the operation  $*$  for  $n = 4$ . (05)

b) Show that  $(z_n, *)$  is a semigroup for any  $n$ . (05)

OR

Q. 5 Find the order and inverse of each element in  $(z_{12}, +)$ . (10)

Q. 6 a) Consider  $a_r - 8a_{r-1} + 16a_{r-2} = 0$  where  $a_2 = 16$  and  $a_3 = 8$ . (05)

b) Find the numeric functions corresponding to  $\frac{z^3}{(1-2z)}$ . (05)

OR

Q. 6 a) Show that  $1 + 2 + 2^2 + 2^3 + \dots + 2^n = 2^{n+1} - 1$ . (05)

b) Prove by induction that the sum of the cubes of three consecutive integers is divisible by 9. (05)

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