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)**

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

OR

Q. 1 Integrate : **(10)**

$\iiint x^2yz\ dx\ dy\ dz$ 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)**

$y^2x = 4a^2\,(2a - x)$ and its asymptote.

OR

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

Q. 3 Obtain the Disjunctive normal form of:

a) $(p \to q) \wedge (\sim p \wedge q)$ **(05)**

b) $\sim (p \to (q \wedge r))$ **(05)**

OR

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

P. T. O.

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

b) Minimize $AB + \overline{AC} + A\bar{B}C\,(AB + C)$ **(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)**

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

Q. 5 Let z_n denote the set of integers $\{0, 1, 2, ---, n-1\}$.
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 $1 + 2 + 2^2 + 2^3 --- + 2^n = 2^{n+1} - 1$. **(05)**

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

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