Roll No. ....

Total No. of Questions : 13] **[Total No. of Pages : 03**

J-3462[S-1318] **[2037]**

B.Sc.(BI) (Semester - 3^{rd})

DISCRETE AND NUMERICAL MATHEMATICS (B.Sc.(BI)-302)

Time : 03 Hours **Maximum Marks : 75**

Instruction to Candidates:

1) Section - A is **compulsory**.
2) Attempt any **Nine** questions from Section - B.

Section - A

Q1)

a) The Inclusion/Exclusion Theorem for three sets says that if there are three sets, A, B and C, then $|A \cup B \cup C| = |A| + |B| + |C|$

. Note that the converse of this theorem is not true. Given a set of 29 students, where 8 need housing and financial aid; 12 need housing, financial aid, and an e-mail account; 17 need an $\cup |A \cap B| - |B \cap C| + |A \cap B \cap C|$ e-mail account and financial aid; 23 need housing, 20 need financial aid, 19 need e-mail accounts, and 4 students don't need anything.

(i) How many students need both housing and e-mail?

(ii) Change the numbers to 57, 8, 3, 21, 21, 32, 31, 8. What is your answer now?

(iii) Which answer is bogus and why? *(2 x 3)*

b) A = {1,2,4,5}, B = {a,b,c,f} and C = {a,5} are three given sets. *(2)*

Compute (A   C) - (A   C) × B

Where '   ', '-', '?' and 'x' are well-known set-theoretic operations.

c) Construct truth table for the following formula: *(2)*

~ (PV~Q) <=> (P = > Q)

d) Obtain the equivalent disjunctive normal form of the formula :~ R V(PVR) *(2)*

e) Define the following concepts giving one example of each. *(3)*

(i) 1-1 Onto function.

(ii) Anti-symmetric relation on a set.

(iii) Partial Order Relation.

P.T.O.

f) (i) min-term in a Boolean Algebra. *(2)*

(ii) 2's complement of a binary number.

g) Determine the validity of the conclusion (represented by 'C:') from the given set of premises.

P -> ~Q, P V R, ~R V ~S, S with conclusion C: ~Q. *(2)*

h) Find equivalent form in Predicate/Propositional Calculus of the following statements :

(i) Nine plus ten equal nineteen.

(ii) Some patients like all doctors.

(iii) Any integer is either positive or negative.

(iv) Every integer is also a real number. *(4)*

i) Write down formula for

(i) Picard's method of successive approximation.

(ii) Modified Euler's method.

(iii) Newton's Raphson method. *(3 + 2 + 2)*

Section - B

(9 x 5 = 45)

Q2) Which of the following are statements? Give reasons for your answer.

(i) What a lovely day !

(ii) 2+3 = 6

(iii) 2+x = 7

(iv) What is the time now?

Q3) Give an example of a finite linearly ordered set. You have to verify all the properties of a linearly ordered set for your example.

Q4) Let U = {1, 2, 3, 4, 5, 6, 7}, A = {1, 2, 7}, B = {1, 2, 3, 4, 5}, C = {4, 6, 7}.

(i) Find A-B and B-C.

(ii) Check that (A B) C = (A C) (B C).

(iii) State and verify any one of the De Morgan's laws for A and B.

Q5) Let A = {1, 2, 3} and R_1 and R_2 be relations on A given by

R_1 = {(1, 1), (1, 2), (2, 3)}

R_2 = {(1, 3), (2, 1), (1, 1), (3, 1)}

(i) Write the relation matrices of R_1 and R_2.

(ii) Find the relation matrix of R_1R_2.

(iii) Check whether R_1R_2 is an equivalence relation.

Q6) Check that (P VQ) V (~ PV~Q) is a tautology.

Q7) Draw the switching circuit corresponding to the function ((x+y).(yz))+(x+z).

Q8) In a survey, 80 Computer Science teachers were asked which of the three programming languages, Pascal, Fortran and C, have they used to introduce programming to students- 40 teachers said they have used Pascal, 35 said they have used Fortran, 25 said they have used C, 20 said they have used both Pascal and Fortran, 17 said they have used Pascal and C, 5 said they have used Fortran and C, and 3 said they have used all the three languages.

(i) How many teachers have used Fortran alone?

(ii) How many teachers have used both Pascal and C?

(iii) How many teachers have used Fortran, but not C?

(iv) How many used none of the three languages?

Q9) Approximate y and z at x = 0.1, using Picard's method for the solution of the equations dy/dx = z, dz/dx = $x^3(y+z)$ given that y(0) = 1 and z(0) = 0.5

Q10) Solve dy/dx = y-(2x/y), y(0) = 1 in the range 0< = x< = 0.2 using Euler's method.

Q11) Use Runge Kutta method of find y when x = 1.2 in steps of 0.1 given that dy/dx = x^2+y^2 and y(1) = 1.5.

Q12) Given Sin45° = 0.7071, Sin 50° = 0.766, Sin 55° = 0.8192, Sin 60° = 0.866, Find Sin 52°, using Newton's forward Interpolation formula.

Q13) Write short notes on the following

(a) Gauss elimination method.

(b) Bisection Method.

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