This question paper contains 4 printed pages.]

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B.A./B.Sc. (Hons.) / III   A

MATHEMATICS -- Paper XVII and XVIII (*v*)

(Computer Mathematics)

Time : 2 Hours   •   **Maximum Marks : 30**

(Write your Roll No. on the top immediately on receipt of this question paper.)

All questions are compulsory.

Symbols have their usual meanings.

1. Attempt any **two** parts :

    (a) (i) If $P(p, q, \ldots..)$ is a tautology, then $P(P_1, P_2, \ldots.)$ is a tautology for any propositions $P_1, P_2, \ldots..$ **2**

        (ii) Express the exclusive disjunction in terms of the connectives $\wedge$, $\vee$ and $\sim$ and give its truth table.   **2**

    (b) (i) Prove $X + \bar{X}Y = X + Y$, by the method of Deduction.   **2**

      (ii)   Define Miniterms and Maxterms. Also, define the sum of the products and the product of the sums form, support your answer with the example.   **2**

(c)   If $f = \pi\,(0, 2, 7)$,

     find the minimal sum, by the Quine McCluskey method.   **4**

2.   Attempt any **two** parts :

   (a) (i)   Using 9's and 10's complement, substract 40 from -35.   **2**

       (ii)   Define overflow. Why overflow is a problem in a digital computer ? How can an overflow problem be detected ? Give simple examples, using 4-bit register, regarding overflow, in all the three forms viz., signed magnitude, signed 1's complement and signed 2's complement representation.   **2**

   (b) (i)   Divide 100.111 by 1001.1, by Restoring Division, upto 7 places of decimal.   **2**

       (ii)   Give a simple example of a single floating point number taken, where the mantissa can accommodate 5 decimal digits, representing both the normalized and the unnormalized form. Also, compare the two forms of that floating point number, telling an advantage of one over the other.   **2**

(c) (i) Perform the arithmetic addition of +5 and −5, using 4-bit register, in the signed magnitude, signed 1's complement and the signed 2's complement representations. **2**

(ii) Are the three representations viz., decimal converted to binary, the binary coded octal and the binary coded hexadecimal exactly the same ? Show with the example taken for decimal 99. **2**

3. (a) (1) Find errors, if any, in the following :

(i) $x > 0$ AND $x < 100$

(ii) 123_45_6789, as an identifier **2**

(2) Give the output corresponding to the following program segment :

FOR i : = 1 to 3 DO

FOR j : = 1 to i DO

FOR k : = 1 to j DO

BEGIN

Write ln ('INDIA')

END;

How many times 'INDIA' will be printed ? **2**

(b) Write a function subprogram to determine the factorial of a given input quantity in Pascal. **3**
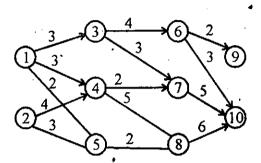
4. (a) State and prove the optimality principle in a
         multistage decision problem.   3

    (b) Find the optimal path from the source to
         sink in the following labelled directed
         graph, exhibiting or explaining the
         procedure you adopt.   4

Source   Sink