This question paper contains 4+2 printed pages]

Your Roll No. .....

9670

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

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.

Choice is given within the question.

1. Attempt any *two* parts :

(*a*) (*i*) Construct the truth table of :

$$p \vee \sim(p \wedge q).$$ 1

(*ii*) State and prove De Morgan's laws of propositions. 1½

P.T.O.

(*iii*) Test the validity of the argument :

$$p \leftrightarrow q,\ q \vdash p.$$ 1½

(*b*) (*i*) Evaluate :

$$\left(A \uparrow B\bar{C}\right) \oplus \left(A\bar{B} \downarrow C\bar{D}\right)$$

for A = 1, B = 0, C = D = 1. 1½

(*ii*) Write the two canonical forms for the logical function :

$$f(A, B, C) = \pi(1, 3, 4)$$

Also design a circuit of any *one* of these forms. 2½

(*c*) Construct the Karnaugh map for :

$$f(A, B, C, D) = \Sigma(0, 2, 4, 8, 10, 12, 14) + d(1, 3, 7, 15)$$

and find :

(*i*) complete sum

(*ii*) minimal sum. 1,1,2

2. Attempt any *two* parts :

(*a*) (*i*) Convert $(536.491)_{10}$ to octal. 1

(*ii*) Divide 10001 by 1101 using restoring division upto three places of binary point. 1½

(*iii*) Write INDIA in 7-bit ASCII code. 1

(*b*) (*i*) What is an overflow ? 1

(*ii*) Using 9's and 10's complement, subtract 335 from –425. 1½

(*iii*) What is an end-around carry ? 1

(*c*) (*i*) When is a floating point number said to be normalized ? 1

(*ii*) Perform binary multiplication :

101.1011 * 10.101. 1½

(*iii*) Why is zero called a dirty zero ? 1

3. Attempt any *two* parts :

(*a*) (*i*) Determine the value of each of the following expressions :

(1) 6 = 7

(2) succ(–5). 1

(*ii*) Identify invalid identifiers with justification :

(1) ROLL#

(2) Id No. 1

(*iii*) Write expression in PASCAL for the following expressions :

(1) $\log_e \sqrt{\frac{1-x}{1+x^2}}$

(2) $\frac{1-e^{-\sqrt{x}}}{\sqrt{\sin(1\times 1+4)}}$. 2

(*b*) (*i*) What is the final value of K in the following program ?

```
K : = 5; I : = 3; L : = 252;
M : = I * 1000 + L * 10
K : = M div 100 + K.
```

1

(*ii*) Write the general form of repeat – until control structure. How does it differ from while_do control structure ? 1½

(*iii*) How many times the word MATRIX will be printed after executing the following skeleton : 1½

```
I : = 8;
While(I < = 20) do
begin
.....
.....
Writeln('MATRIX');
.....
.....
I : = I + 3
end;
```

(*c*) Wtite a program in PASCAL to find the average of any 12 numbers. 4

4. (*a*) What is a multistage decision problem ? Which principle is used to solve a multistage decision problem ? State it. 2

(*b*) Find the optimal path from the source to sink in the following labelled directed graph, exhibiting or explaining the procedure you adopt. 5