

[E] Attempt the following:

- (a) Write a program to print all prime numbers from 1 to 300.  
(Hint: Use nested loops, **break** and **continue**)

- (b) Write a program to fill the entire screen with a smiling face. The smiling face has an ASCII value 1.
- (c) Write a program to add first seven terms of the following series using a **for** loop:

$$\frac{1}{1!} + \frac{2}{2!} + \frac{3}{3!} + \dots$$

- (d) Write a program to generate all combinations of 1, 2 and 3 using **for** loop.
- (e) A machine is purchased which will produce earning of Rs. 1000 per year while it lasts. The machine costs Rs. 6000 and will have a salvage value of Rs. 2000 when it is condemned. If 9 percent per annum can be earned on alternate investments, write a program to determine what will be the minimum life of the machine to make it a more attractive investment compared to alternative investment?
- (f) Write a program to print the multiplication table of the number entered by the user. The table should get displayed in the following form:

$$29 * 1 = 29$$

$$29 * 2 = 58$$

...

- (g) Write a program to produce the following output:

A B C D E F G F E D C B A

A B C D E F F E D C B A

A B C D E E D C B A

A B C D D C B A

A B C C B A

A B B A

A A

- (h) Write a program to produce the following output:

```

          1
        2   3
      4   5   6
    7   8   9  10
  
```

- (i) Write a program to produce the following output:

```

          1
        1   1
      1   2   1
    1   3   3   1
  1   4   6   4   1
  
```

- (j) According to a study, the approximate level of intelligence of a person can be calculated using the following formula:

$$i = 2 + (y + 0.5x)$$

Write a program that will produce a table of values of **i**, **y** and **x**, where **y** varies from 1 to 6, and, for each value of **y**, **x** varies from 5.5 to 12.5 in steps of 0.5.

- (k) When interest compounds **q** times per year at an annual rate of **r** % for **n** years, the principal **p** compounds to an amount **a** as per the following formula

$$a = p(1 + r/q)^{nq}$$

Write a program to read 10 sets of **p**, **r**, **n** & **q** and calculate the corresponding **as**.



- (l) The natural logarithm can be approximated by the following series.

$$\frac{x-1}{x} + \frac{1}{2} \left( \frac{x-1}{x} \right)^2 + \frac{1}{2} \left( \frac{x-1}{x} \right)^3 + \frac{1}{2} \left( \frac{x-1}{x} \right)^4 + \dots$$

If  $x$  is input through the keyboard, write a program to calculate the sum of first seven terms of this series.

- (m) Write a program to generate all Pythagorean Triplets with side length less than or equal to 30.
- (n) Population of a town today is 100000. The population has increased steadily at the rate of 10 % per year for last 10 years. Write a program to determine the population at the end of each year in the last decade.
- (o) Ramanujan number is the smallest number that can be expressed as sum of two cubes in two different ways. Write a program to print all such numbers up to a reasonable limit.
- (p) Write a program to print 24 hours of day with suitable suffixes like AM, PM, Noon and Midnight.
- (q) If Loan amount, Number of months and Rate of Interest are entered through the keyboard, write a program to calculate the monthly installment (including contribution towards Principal and Interest) for each month of loan duration.