B. Tech. (M) / III   A

PAPER : EME–302— NUMERICAL TECHNIQUES AND COMPUTER PROGRAMMING

Time : 3 hours   *Maximum Marks* : 70

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

*Attempt five questions in all, selecting at least two
questions from each Part. All questions carry
equal marks. Assume missing data, if any.*

PART A

1. (*a*) Find the output of the following program
   segments:

   (*i*)   INTEGER KNUM(10), SUM(10)

   DO 50 I=1,5

   KNUM(I)=100–I*10

   50 CONTINUE

   DO 35 J=1,5

   SUM(J)=KNUM(6–J)

   35 CONTINUE

   PRINT*, KNUM(5), SUM(4), KNUM(1),

                                    SUM(2)

   STOP

   END

   (*ii*)   I = 7

            J = 6

            A = I/J

            B = J/I

            I = A+B+A*I/J*4

            A = I

            B = A/I+I*A/(I/J)

            PRINT*, A, B, I, J

            STOP

            END   6

(*b*) Using DO statement WAP in FORTRAN to find the sum of:

$$\frac{1}{1^3} - \frac{1}{2^3} + \frac{1}{3^3} - \frac{1}{4^3} + \frac{1}{5^3} - \frac{1}{6^3} + \ ....$$

containing 65 terms.   8

2. WAP in FORTRAN to find the value of S for R=5, 10, 15, ..., 250 where:

$$S = \begin{cases} 17000 - 0\cdot485\ R^2 & \text{if } R < 120 \\[2mm] \dfrac{18000}{1 + \dfrac{R^2}{18000}} & \text{if } R \geq 120 \end{cases}$$

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3. Draw a flowchart to find the average of non-negative numbers from a given set of *n* (say *n*=40) numbers. 14

4. Define the following in detail:

   (*i*) Logical IF and arithmetic IF statements

(*ii*) Object program and source program

(*iii*) Subscripted   variables   and   DIMENSION
statement

(*iv*) GOTO and Computed GOTO statements

(*v*) STOP and END statements

(*vi*) Relational and logical operators

(*vii*) Fortran variables and logical variables.   14

PART B

5. (*a*) Apply Runge-Kutta method, taking $h=0.1$ to calculate the value of *y* for $x=0.2$ correct to three decimal places, when:

$$\frac{dy}{dx} = x-2y, \; y=1 \text{ for } x=0.$$

(*b*) Apply Simpson's 1/3 and 3/8 rule, to find the

value of: $\displaystyle\int_0^6 \frac{dx}{1+x}.$ 14

6. (*a*) Use a central difference Gauss's Backward formula to obtain $f(32)$, given that:

$f(25)=0.2707, \; f(30)=0.3027,$

$f(35)=0.3386, \; f(40)=0.3794.$

(*b*) Show that:

(*i*) $\Delta(e^{ax} \log bx)=$

$$e^{ax}\left[e^{ah}\log(1+\frac{h}{x})+(e^{ah}-1)\log bx\right]$$

. P. T. O.

(ii) $\Delta\left(\dfrac{x^2}{\cos 2x}\right)=$

$$\dfrac{h(2x+h)\cos 2x + 2x^2 \sin h \sin (2x+h)}{\cos (2x + 2h)\cos 2x}$$

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7. (a) In an examination the number of candidates who obtained marks between certain limits were as follows:

Marks:	30–40	40–50	50–60	60–70	70–80
No. of Students:	31	42	51	35	31

Find the number of candidates whose scores lie between 45 and 50.

(b) Find $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$ for $x=1$, for a function tabulated below:

x:	1	2	3	4	5	6
y:	1	8	27	64	125	216

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8. (a) Estimate the production of cotton in the year 2009 from the data given below:

Year:	2005	2006	2007	2008	2009	2010
Production:	17·1	13·0	14·0	9·6	–	12·4

Production is in millions of bales.

(b) Find a real root of the equation $x^3-2x-5=0$ by the method of false position correct to three decimal places.

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