

७ ज्यैष्ठ कृष्ण शुक्रवार २०६७
सप्तमी घ: १२/२७/११
Hizri-20 Zamadius-sani 1431
४ जुन २०१०
Sunrise-04-54 A.M.

JUNE
04
FRIDAY

२० ज्यैष्ठ शुक्रवार १९८७
सप्तमी घ १२/२७/११
Saka-14 Jaistha 1987
अहम - २० ज्यैष्ठ १९८७
Sunset - 06-14 P.M.

Name → Piyush Chandra Chandra

Semester → 4TH , ID-1811100001027

Assignment → Engineering Mathematics IV

Topic → Runge - Kutta Method

JUNE	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

२१-२२ ज्यैष्ठ शनि-रवि १८१९
अष्टमी-नवमी घ-अ २/२०-८/६
Saka-15-16 Jaistha 1932
वह्न - २१-२२ ज्यैष्ठ १८१९
Sunrise-04-54-04-54 A.M.

JUNE
05
SATURDAY

८-९ ज्यैष्ठ कृष्ण शनि-रवि २०६७
अष्टमी-नवमी घ-अ: २/२३-८/६
Hizri-21-22 Zamadi-usani 1431
९-६ जुन २०१०
Sunset - 06-14-06-15 P.M.

1) Given $\frac{dy}{dx} = y - x$ with $y(0) = 2$, find $y(0.1)$ and $y(0.2)$

convert upto four decimal places using RK4 method.

⇒ Given that, $f(x, y) = y - x$, $x_0 = 0$, $y_0 = y(x_0) = 2$
taking, $h = 0.1 \rightarrow x_1 = x_0 + h = 0 + 0.1 = 0.1$,
 $x_2 = x_1 + h = 0.1 + 0.1 = 0.2$

To find, $y(0.1) = y_1$ & $y(0.2) = y_2$

Step 1 = Put $x = 0$ into Runge Kutta formula

$$y(0.1) = y_1 = y_0 + \frac{1}{6} [K_1 + 2K_2 + 2K_3 + K_4]$$

$$K_1 = h f[x_0, y_0] = 0.1 [y_0 - x_0] = 0.1 \times [2 - 0] = 0.2$$

$$K_2 = h f[x_0 + h/2, y_0 + K_1/2]$$

$$= 0.1 f[0 + \frac{0.1}{2}, 2 + \frac{0.2}{2}]$$

$$= 0.1 f[0.05, 2.1] = 0.205$$

$$K_3 = h f[x_0 + h/2, y_0 + \frac{K_2}{2}]$$

$$= 0.1 f[0.05, 2 + \frac{0.205}{2}]$$

$$= 0.1 f[0.05, 2.1025] = 0.20525$$

$$K_4 = h f[x_0 + h, y_0 + K_3]$$

$$= 0.1 f[0 + 0.1, 2 + 0.20525]$$

$$= 0.1 f[0.1, 2.20525] = 0.210525$$

Sunday 06

Put, K_1, K_2, K_3 & K_4 into y_1

$$y_1 = y(0.1) = y_0 + \frac{1}{6} [K_1 + 2K_2 + 2K_3 + K_4]$$

$$= 2 + \frac{1}{6} [0.2 + (2 \times 0.205) + (2 \times 0.20525) + 0.210525] = 2.20517 \approx 2.2052$$

$y(0.1)$ correct upto 4 decimal places is 2.2052

Ans ①

T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	JULY							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	2010

१० ज्यैष्ठ कृष्ण सोमवार २०६७
दशमी अ: ७/२७/३३
Hizri-23 Zamadius-sani 1431
७ जून २०१०
Sunrise-04:54 A.M.

JUNE
07
MONDAY

२७ ज्यैष्ठ सोमवार १४३१
दशमी अ: ७/२७/३३
Saka-17 Jaistha 1932
अहम - २७ ज्यैष्ठ १४३१
Sunset - 06:15 P.M.

To find, $y(0.2) = y_1$

Step 2:- Put $n=0$ into Runge-Kutta formulae.

$$K_1 = hf(x_0, y_0) = 0.2f(0, 2) = 0.4$$

$$K_2 = hf(x_0 + h/2, y_0 + K_1/2) \\ = 0.2f(0 + 0.1, 2 + 0.2) \\ = 0.2f(0.1, 2.2) = 0.42$$

$$K_3 = hf(x_0 + h/2, y_0 + K_2/2) \\ = 0.2f(0.1, 2 + 0.42/2) \\ = 0.2f(0.1, 2.21) = 0.422$$

$$K_4 = hf(x_0 + h, y_0 + K_3) \\ = 0.2f(0 + 0.2, 2 + 0.422) \\ = 0.2f(0.2, 2.422) = 0.4444$$

$$y(0.2) = y_1 + \frac{1}{6} [0.4 + (2 \times 0.42) + (2 \times 0.422) + 0.4444] \\ = 2 + \frac{1}{6} \times 2.5284 = 2.4214$$

$y(0.2)$ correct upto 4 decimal places is 2.4214

2) Solve $dy/dx = 2xy^2$ with $y(0) = 1$ and $h = 0.2$ on the interval 0.1 using RK4 method.

⇒ Here, $x_0 = 0$, $y_0 = 1$ and $h = 0.2$, then we can find

$$K_1 = hf(x_0, y_0) = 0.2f(0, 1) = 0$$

$$K_2 = hf(x_0 + h/2, y_0 + K_1/2) \\ = 0.2f(0 + 0.1, 1 + 0) \\ = 0.2f(0.1, 1) = 0.04$$

JUNE	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T
2010	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	*

১৪ জ্যৈষ্ঠ মঙ্গলবার ১৪১৭
 বঙ্গাব্দ স ৬/২২/৫৭
 Saka-18 Jaistha 1932
 পূর্বাহ্ন - ২৪ জ্যৈষ্ঠ ১৪১৭
 Sunrise-04-54 A.M.

JUNE
08
TUESDAY

११ ज्यैष्ठ कृष्ण मंगलवार २०६७
एकादशी सः ६/२२/७७
Hizri-24 Zamadi-us-sani 1431
८ जुन २०१०
Sunset - 06-15 P.M.

$$k_3 = hf(x_0 + h/2, y_0 + k_2/2) = 0.2 f(0.1, 1 + 0.04/2) = 0.2 f(0.1, 1.02) = 0.01616$$

$$K_4 = h f(x_0 + h, y_0 + x_3) \\ = 0.2 f(0 + 0.2, 1 + 0.041616) \\ = 0.2 f(0.2, 1.041616) = 0.086797$$

$$y(0.1) = y_0 + \frac{1}{6} [k_1 + 2k_2 + 2k_3 + k_4]$$

$$= 1 + \frac{1}{6} [0 + (2 \times 0.09) + (2 \times 0.091616) + 0.86797]$$

$$= 1.04167.$$

T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	JULY							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	2010