B. Tech. (II Yr.)

Total Pages : 4

Roll No. .....

Course No. : BS–211

M–I/85

# Second Year B. Tech. of the Four Year Integrated Degree Course Examination, 2016–17

## (Common for all Branches)

SEMESTER–I

## MATHEMATICS–III

Time : Three Hours

Maximum Marks : 80

*"Do not write anything on question paper except Roll Number otherwise it shall be deemed as an act of indulging in use of unfair means and action shall be taken as per rules."*

(i) Attempt **five** questions in all.

(ii) The Question Paper has **four** Units. Each unit has **two** questions.

(iii) Attempt at least **one** question from each Unit.

(iv) Answer should be to the point.

(v) All questions carry equal marks.

## UNIT–I

1. (a) Evaluate

$$\Delta^2\left(\frac{5x+12}{x^2+5x+6}\right);$$

interval of difference being unity.

(b) From the given data, find f(70) :

| x | 40 | 60 | 80 | 100 | 120 |
|---|---|---|---|---|---|
| y | 250 | 370 | 470 | 540 | 590 |

Use Newton's forward difference formula.

2. (a) Use Newton's backward difference formula to find f(2.5) :

| x | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| y | 1 | 3 | 7 | 13 |

(b) Given the following pairs of values of x; y :

| x | 5 | 6 | 9 | 11 |
|---|---|---|---|---|
| y | 12 | 13 | 14 | 16 |

Interpolate the value of y at x = 10.

## UNIT–II

3. (a) Apply Gauss's backward formula to find y at x = 19, given that :

| x | 10 | 15 | 20 | 25 | 30 |
|---|---|---|---|---|---|
| y | 1.79 | 2.39 | 3.20 | 4.29 | 5.74 |

(b) For given data :

| x | 20 | 24 | 28 | 32 |
|---|---|---|---|---|
| y | 2854 | 3162 | 3544 | 3992 |

Find y when x = 25, using Stirling's formula.

4. (a) Use Bessel's formula, to find y(25), given :

| x | 20 | 24 | 28 | 32 |
|---|---|---|---|---|
| y | 24 | 32 | 35 | 40 |

(b) Find the value of f'(x) at x = 0.04 from the following table :

| x | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 |
|---|---|---|---|---|---|---|
| y | 0.1023 | 0.1047 | 0.1071 | 0.1096 | 0.1122 | 0.1148 |

Use the Gauss's forward formula.

## UNIT–III

5. (a) Evaluate $\int_0^{\pi/2} \sqrt{\cos\theta}\, d\theta$ by dividing the interval into eight equal parts, using Simpson's 1/3 rule.

(b) Apply Picard's method to find the solution of the differential equation $\frac{dy}{dx} = y - x$ with $x = 0$, $y = 2$ upto the third order of approximation.

6. (a) Given $\frac{dy}{dx} = x^2 + y; y(0) = 1; h = 0.02$. Determine $y(0.02)$ using the modified method of Euler's.

(b) Use Runge-Kutta method of fourth order to find the numerical solution at $x = 0.8$ for $\frac{dy}{dx} = \sqrt{(x+y)}$; $y(0.4) = 0.41$; $h = 0.2$.

## UNIT–IV

7. (a) Prove that $L\left(\frac{\sin^2 t}{t}\right) = \frac{1}{4}\log\left(\frac{s^2+4}{s^2}\right)$.

(b) Evaluate $L^{-1}\left[\frac{s}{s^4+s^2+1}\right]$.

8. (a) Use convolution theorem to find

$$L^{-1}\left[\frac{1}{(s+1)(s^2+1)}\right].$$

(b) Use Laplace transformation technique to solve the following differential equation :

$(D^2 + 3D + 2)y = 1$, given that $y(0) = 0$ $y'(0) = 0$, $D \equiv d/dt$.