

B.Tech. (II Yr.)

Corrected

Total Pages : 4

Roll No.

✓ CENTRE SUPERINTENDENT

College of Technology & Engineering Course No. : BS-211
UDAIPUR (Raj.)

M-V/176

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Second Year B.Tech. of the Four Year Integrated
Degree Course Examination, 2015-16
(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.

P. T. O.

M-V/176/I/2015-16/375/ZZ/91

UNIT-I

1. (a) Show that :

$$u_0 + {}^n C_1 u_1 x + {}^n C_2 u_2 x^2 + \dots + u_n x^n = (1+x)^n u_0 + {}^n C_1 (1+x)^{n-1} x \Delta u_0 + {}^n C_2 (1+x)^{n-2} x^2 \Delta^2 u_0 + \dots + x^n \Delta^n u_0.$$

(b) Using Lagrange's interpolation formula, find the value of $\log_{10} 301$ from the following data :

x	: 300	304	305	307
$\log_{10} x = f(x)$: 2.477	2.482	2.484	2.4871

2. (a) Represent the function $f(x) = x^4 - 12x^3 + 24x^2 - 30x + 9$ and its successive differences in factorial notation, the interval being unity.

(b) Use Newton-Gregory interpolation formulas to compute $y(3.62)$ and $y(3.73)$ from the following table :

x	: 3.60	3.65	3.70	3.75
y	: 36.598	38.475	40.447	42.521

UNIT-II

3. (a) Use Stirling formula to find y_{28} , given that

$$y_{20} = 49225, y_{25} = 48316, y_{30} = 47236, y_{35} = 45926, y_{40} = 44306.$$

- (b) Find the first derivative of $f(x)$ at $x = 0.1$ and 0.4 from the following table :

x	0.1	0.2	0.3	0.4
y	1.10517	1.22140	1.34986	1.49182

4. (a) Use Bessel's formula to find y_{25} , from the following data :

$$y_{20} = 2854, y_{24} = 3162, y_{28} = 3544, y_{32} = 3992.$$

- (b) Use Gauss's forward interpolation formula to find $f(32)$ given that :

$$f(25) = 0.2707, f(30) = 0.3027, f(35) = 0.3386, \\ f(40) = 0.3794.$$

UNIT-III

5. (a) Use Simpson's '1/3' and '3/8' rule to evaluate the following :

$$\int_0^1 \frac{dx}{1+x}$$

Hence obtain the approximate value to $\log_e 2$ in each case.

- (b) Solve the differential equation :

$$\frac{dy}{dx} = x + y, y(0) = 0.$$

for $x = 0.2$ by Picard's method upto fourth approximations.

6. (a) Evaluate the integral

$$\int_0^{\pi/2} \sqrt{\cos \theta} d\theta$$

by dividing the interval into nine ordinates.

(b) Using Runge-Kutta method, obtain a solution of the equation :

$$\frac{dy}{dx} = \frac{(1+x)^2}{y^2} + \frac{y}{(1+x)}; y(0) = 3$$

for the range $0 \leq x \leq 0.3$ using $h = 0.1$.

UNIT-IV

7. (a) Find Laplace transform of the function $\sin \sqrt{x}$ and hence or otherwise obtain Laplace transform

of $\frac{\cos \sqrt{x}}{\sqrt{x}}$.

(b) Find the inverse Laplace transform of $\log \sqrt{1 + \frac{9}{s^2}}$.

8. (a) State and prove convolution theorem for Laplace transform.

(b) Use Laplace transform theory to solve the following equation :

$$(D^2 + 1)y = x \cos x, \text{ where } y = 0, \frac{dy}{dx} = 0 \text{ at } x = 0.$$