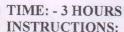
Seat No.

GANPAT UNIVERSITY

B.TECH. (CE/IT) SEM.III REGULAR THEORY SUBJECT: 2HS301 MATHEMATICS - III (CE/IT) NOVEMBER – DECEMBER 2011



TOTAL MARKS: 70

- 1. All questions are compulsory.
- 2. Write answer of each section in separate answer books.
- 3. Figures to the right indicate marks of questions.

SECTION - I

Que-1

(12)

- [A] Derive $L\left\{e^{at}\right\}$ and Evaluate: $L\left\{\frac{1-e^{t}}{t}\right\}$
- [B] Evaluate: (1) $L\left\{ \left(t+2\right)^2 e^t \right\}$
- Solve differential equation y'' + 2y'' y 2y = 0, y(0) = 1, y'(0) = 2, y'(0) = 2

Que-1

(12)

- [A] Derive $L\{Sin\ at\}$ and Evaluate: $L\{t\ Sinh3t\}$
- Evaluate: (1) $L\left\{e^{-3t}u(t-2)\right\}$ (2) $L^{-1}\left\{\log\left(\frac{S^2+1}{S^2}\right)\right\}$
- Solve differential equation y + 4y = Sint, y(0) = 1, y'(0) = 0

Que-2

Find a Fourier series to represent: f(x) = x, $-\pi \le x \le \pi$.

(03)

Hence deduce: $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + ---$

[B] Find a Fourier series for the function : $f(x) = \begin{cases} -K & ; & -\pi \le x \le 0 \\ K & ; & 0 \le x \le \pi \end{cases}$

[C] Find the half range cosine series for: $f(x) = \pi x - x^2$, $0 \le x \le \pi$

(04)

Que-2

[A] Find a Fourier series for the function: $f(x) = e^{-x}$, [-2,2]

(03)

(04)

- [B] Find a Fourier series to represent the function $f(x) = \pi^2 x^2$; $-\pi \le x \le \pi$
- DIRIGHT
- [C] Find the half range sine series to represent $f(x) = x \sin x$, $0 < x < \pi$

(04)

Que-3 Attempt any three:

(12)

- [A] Find a Fourier integral representation of the function $f(x) = \begin{cases} 1 & ; & |x| < 1 \\ 0 & ; & |x| > 1 \end{cases}$ and hence evaluate $\int_{0}^{\infty} \frac{\sin \lambda \cos \lambda x}{\lambda} d\lambda$
- [B] Find the Fourier sine transform of $f(x) = \begin{cases} \sin kx & \text{if } 0 \le x < a \\ 0 & \text{if } x > a \end{cases}$
- [C] State & Prove convolution theorem.
- [D] Find a Fourier series to represent the function $f(x) = x^2$, $-\pi \le x \le \pi$

Hence deduce: $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2 + 7^2} + ---$

SECTION - II

Que-4

(12)

- [A] Find the root of $x \cos x = 0$ using Bisection method correct up to three decimal places.
- [B] Find the root of $\frac{dy}{dx} = x + y + xy$; y(0) = 1 using Euler's method at x = 0.1.
- [C] Solve the following system of linear equation using Gauss Jordan method 10x + y + z = 12, 2x + 10y + z = 13, x + y + 5z = 7.

[B] Find a Fourier series for the function $\mathbf{SO}(x) = \begin{bmatrix} -K & x \\ x & x \end{bmatrix}$

Que-4

(12)

Find the root of equation $x^3 = 5x + 6$, by using False Position method correct up to three decimal places.

- [B] Obtain Picard's second approximate solution of the initial value problem $\frac{dy}{dx} = x^2 + y^2$, y(0) = 0 for x = 0.4 correct to four decimal places.
- [C] Solve the following system of linear equations using Gauss Seidel method 27x + 6y z = 85, 6x + 5y + 2z = 72, x + y + 54z = 110.

Que-5

[A] Duor	Prove that : $\Delta \log f(x) = \log$	$\int_{1+} \Delta f(x)$		(03)
[A]	Frove that . $\triangle \log f(x) = \log$	f(x)		

(04)

(04)

(04)

(12)

[B] Using the following table find Y when X=10

X	5	6	9	11
Y	12	13	14	16

[C] Using the following table find f(32)

X	1911	1921	1931	1941	1951	1961
Y	12	15	20	27	39	52

OR

Que-5

[A] Prove that:
$$(1+\Delta)(1-\nabla)=1$$

[B] Find f'(2.0) & f''(2.0) from the following observation table

X	1.5	2.0	2.5	3.0	3.5	4.0
v	3.375	7.0	13.625	24.0	38.875	59.0

[C] Solve differential equation:
$$y_{n+2} - 7y_{n+1} + 10y_n = 4^n + 12e^{3n}$$
 (04)

Que-6 Attempt any three:

[A] Prove that Sin hz is an analytic function.

[B] If
$$f(z)$$
 is an analytic function of z then prove that $\left[\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right] |f(z)|^2 = 4 |f'(z)|^2$

Find the Bilinear transformation which maps the points z = 1, i, -1 in to the points w = i, 0, -i

[D] Evaluate:
$$\int_{0}^{1+i} \left[x - y + i x^2 \right] dz$$
 along the straight line from $z = 0$ to $z = 1 + i$

END OF PAPER