Seat No._____

GANPAT UNIVERSITY

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

TIME: - 3 HOURS **TOTAL MARKS: 70**

INSTRUCTIONS:

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 $L\{e^{at}\}$ and Evaluate: $L\left\{\frac{1-e^{t}}{t}\right\}$

[B] Evaluate: (1) $L\{(t+2)^2 e^{t}\}$ (2) $L^{-1}\left\{\frac{1}{S^2-S-2}\right\}$

[C] Solve differential equation $y''' + 2y'' - y' - 2y = 0$, $y(0)=1$, $y'(0)=2$, $y'(0)=2$

OR

Que-1 **(12)**

[A] Derive $L\{Sin\,at\}$ and Evaluate: $L\{t\,Sinh3t\}$

[B] Evaluate: (1) $L\{e^{-3t}u(t-2)\}$ (2) $L^{-1}\left\{\log\left(\frac{S^2+1}{S^2}\right)\right\}$

[C] Solve differential equation $y'' + 4y = Sint$, $y(0)=1$, $y'(0)=0$

Que-2

[A] 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 : $f(x) = \begin{cases} -K & ; \ -\pi \le x \le 0 \\ K & ; \ 0 \le x \le \pi \end{cases}$ **(04)**

[C] Find the half range cosine series for: $f(x) = \pi x - x^2$, $0 \le x \le \pi$ **(04)**

OR

Que-2

[A] Find a Fourier series for the function: $f(x) = e^{-x}$, $[-2,2]$ **(03)**

[B] Find a Fourier series to represent the function $f(x) = \pi^2 - x^2$; $-\pi \le x \le \pi$ **(04)**

[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 $f(x) = \begin{cases} \sin kx & ; \ 0 \le x < a \\ 0 & ; \ x > a \end{cases}$

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

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

$10x + y + z = 12$, $2x + 10y + z = 13$, $x + y + 5z = 7$.

OR

Que-4 **(12)**

[A] 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] Prove that : $\Delta \log f(x) = \log\left[1 + \frac{\Delta f(x)}{f(x)}\right]$ **(03)**

[B] Using the following table find Y when X=10 **(04)**

X	5	6	9	11
Y	12	13	14	16

[C] Using the following table find f(32) **(04)**

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

OR

Que-5

[A] Prove that : $(1+\Delta)(1-\nabla) = 1$ **(03)**

[B] Find f '(2.0) & f ''(2.0) from the following observation table **(04)**

x	1.5	2.0	2.5	3.o	3.5	4.0
y	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:** **(12)**

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

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

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

[D] Evaluate : $\int_0^{1+i} \left[x - y + ix^2\right] dz$ along the straight line from $z = 0$ to $z = 1+i$

END OF PAPER