Seat No._____

GANPAT UNIVERSITY

B.Tech. (EC) Sem. – III CBCS Regular Theory
Subject: 2HS301 Engineering Mathematics III
November – December 2012

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 **Answer the following.** **(12)**

[A] Evaluate: $\int_0^6 \frac{dx}{1+x^2}$ by Simpson's one third rule.

[B] Find the real root of $f(x) = xe^x - 2$ which lies between 0.8 and 0.9, using False position method correct up to three decimal places.

[C] Find the root of $\frac{dy}{dx} = y - \frac{2x}{y}$, $y(0) = 1$, using Taylor series expansion compute y(0.1) correct up to four decimal places.

OR

Que-1 **Answer the following.** **(12)**

[A] Evaluate: $\int_0^1 \frac{x^2}{1+x^3} dx$ by Simpson's one third rule and divide the interval into four parts.

[B] Find the root of $x^3 + 2x^2 + 10x - 20 = 0$, using Newton Raphson method correct up to three decimal places, taking initial point $x_0 = 2$.

[C] Find the root of $\frac{dy}{dx} = x + y^2$, $y(0) = 1$, using Picard's method. Find y at x = 0.1.

Que-2 **Answer the following.**

[A] State & Prove Cauchy's theorem. **(03)**

[B] Show that $u = y^3 - 3x^2y$ is a Harmonic function. Find its Harmonic conjugate. Also find corresponding analytic function. **(04)**

[C] Evaluate : $\int_c \frac{dz}{z^2 - 2z}$ where c is the circle $|z-2| = 1$ **(04)**

OR

Que-2 **Answer the following.**

[A] Find the Bilinear transformation which maps the points $z = 2, i, -2$ in to the points $w = 1, i, -1$ **(03)**

[B] Prove that *Sin hz* is an analytic function.

[C] Evaluate : $\int_c \frac{e^{2z}}{(z-1)(z-2)}dz$ where c is the circle $|z|=3$

Que-3 **Attempt any three:** **(12)**

[A] Find $\left\{\frac{\Delta^2}{E}\right\}X^3$, when I.d. = 1

[B] Find $f'(1.5)$ and $f''(1.5)$ for the following data

X	1.5	2.0	2.5	3.0	3.5	4.0
Y	3.375	7.000	13.625	24.000	38.875	59.000

[C] Using the following table find f(1946)

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

[D] Solve the difference equation : $y_{n+2} - y_{n+1} + y_n = 0$

SECTION – II

Que-4 **Answer the following.** **(12)**

[A] Find a Fourier series to represent for $f(x) = x\sin x,\ 0 < x < 2\pi$

[B] Find a Fourier series representation of function $f(x) = \begin{cases} -k, & -\pi < x < 0 \\ k, & 0 < x < \pi \end{cases}$.

[C] Find the half range cosine series for $f(x) = x^2;\ 0 < x < \pi$.

OR

Que-4 **Answer the following.** **(12)**

[A] Find a Fourier series for the function: $f(x) = e^{ax}\ ;\ -\pi \le x \le \pi$

[B] Find a Fourier series representation of function $f(x) = \begin{cases} -x^2, & -\pi < x < 0 \\ x^2, & 0 < x < \pi \end{cases}$.

[C] Find the half range cosine series for $f(x) = (x-1)^2\ ;\ 0 < x < 1$.

Que-5 **Answer the following.**

[A] Evaluate: (1). $L\{\sinh^3 2t\}$ (2). $L\{e^{-t}\sin^2 2t\}$ **(03)**

[B] Evaluate: (1). $L^{-1}\left\{\frac{S+2}{S^2-4S+13}\right\}$ (2). $L^{-1}\left\{\frac{1}{s(s^2+a^2)}\right\}$ **(04)**

[C] Use Laplace transform evaluate : $\int_0^\infty \frac{e^{-t}\sin^2 t}{t}\,dt$ **(04)**

OR

Que-5 **Answer the following.**

[A] Find (1). $L\{e^{2t}sin2t\cos t\}$ (2). $L\{e^{-3t}sin(3t+2)\}$ **(03)**

[B] Find (1). $L^{-1}\left\{\frac{2s+6}{s^2+4}\right\}$ (2). $L^{-1}\left\{\log\left(\frac{s+1}{s-1}\right)\right\}$ **(04)**

[C] Use Laplace transform solve: $(D^2+4)y=\sin t$, Where y(0) = 1 and y'(0) = 0 **(04)**

Que-6 **Attempt any three:** **(12)**

[A] Express $f(x)=|\sin x|$, $-\pi \le x \le \pi$ as Fourier series.

[B] State the Convolution theorem and using it evaluate $L^{-1}\left\{\frac{1}{s^2(s^2+a^2)}\right\}$.

[C] Find the Laplace transform of square wave function given by $f(t)=\begin{cases}-1, & 0<t<a\\ 1, & a<t<2a\end{cases}$

[D] Define Unit step Function and Find $L^{-1}\left\{\frac{e^{-2s}}{s-3}\right\}$

END OF PAPER