Seat No._______

GANPAT UNIVERSITY

B. Tech. Semester – III (Civil Engineering)

CBCS Regular Theory Examination Dec 2012.

Subject: 2CI301 Mathematics – II

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 **Attempt the following:** **(12)**

(A) *Evaluate :* (1) $L\left\{e^{t}(2\cos 3t+4\sin 5t)\right\}$ (2) $L\left\{\dfrac{e^{-at}-e^{-bt}}{t}\right\}$

(B) *Evaluate:* (1) $L^{-1}\left\{\dfrac{1}{(S-2)^{2}+4}\right\}$ (2) $L^{-1}\left\{\dfrac{S}{(S^{2}+1)(S^{2}+9)}\right\}$

(C) *Using Laplace method, solve the initial value problem* $\dfrac{d^{2}y}{dt^{2}}+5\dfrac{dy}{dt}+6y=e^{t}$, *where* $y(0)=0$, $y'(0)=1$

Que: 1 **OR** **(12)**

(A) *Find the Laplace Transform of* $f(t)=\begin{cases}(t-1)^{2}, & 0<t<1\\ 0, & t\geq 1\end{cases}$

(B) *If* $L\{f(t)\}=\overline{f(s)}$ *, prove* $L\{t^{n}.f(t)\}=(-1)^{n}\dfrac{d^{n}}{ds^{n}}L\{f(t)\}$*. Using it find* $L\{t.\cosh t\}$

(C) *State convolution theorem and apply it to evaluate:* $L^{-1}\left\{\dfrac{1}{(S+1)(S^{2}+1)}\right\}$

Que: 2 ***Attempt the following:***

(A) *Expand :* $f(x)=e^{x}$ *in a half range cosine series in the interval* $[0,\ l]$ **(03)**

(B) *Find a Fourier series for the function :* $f(x)=\begin{cases}-x^{2}; & 0\leq x\leq\pi\\ x^{2}; & \pi\leq x\leq 2\pi\end{cases}$ **(04)**

(C) *Find a Fourier series representation of* $f(x)=x+x^{2}$, $-\pi<x<\pi$ **(04)**

Que: 2 **OR**

(A) *Find the half range cosine series to represent* $f(x)=1-x$, $0\leq x\leq 1$ **(03)**

(B) *Find a Fourier series to represent the function* $f(x)=\cosh x$, $-\pi\leq x\leq\pi$ **(04)**

(C) *Find a Fourier series for the function:* $f(x)=\sqrt{1+\cos x}$ $-\pi<x<\pi$, **(04)**

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

(A) *Find the Fourier integral of* $f(x) = \begin{cases} 1 & ; |x| \le 1 \\ 0 & ; |x| > 1 \end{cases}$ *and hence evaluate*

$(1)\ \int_0^\infty \frac{\sin\lambda . \cos\lambda x}{\lambda} d\lambda$ *and* $(2)\ \int_0^\infty \frac{\sin\lambda .}{\lambda} d\lambda$

(B) *Find Fourier cosine transform of* $e^{-2|x|}$. *Hence show that* $\int_0^\infty \frac{\cos\lambda x}{\lambda^2 + 4} dx = \frac{\pi}{2} e^{-2|x|}$

(C) *Using partial fraction method, find* $L^{-1}\left\{\frac{1}{(S+2)^2(S-2)}\right\}$

(D) (1) *Find :* $L\{\cos t . \cos 2t . \cos 3t\}$ (2) *Prove that:* $L\{e^{at}\} = \frac{1}{s-a}\ ; s > a$

Section – II

4 **(12)**

(A) Check whether the given functions are analytic or not $w = z^{\frac{5}{2}}$.

(B) State and prove Cauchy's theorem in complex theory.

(c) Find fixed points & normal form for the given bilinear transformation $w = \frac{z-1}{z+1}$

OR

Que: 4 **(12)**

(A) Evaluate $\oint \frac{\cos \pi z}{(z-1)(z-2)}\, dz$ where $C: |z| = 3$

(B) Use Milne – Thomson's method to find an analytic fu^n whose real part is $x^2 - y^2$

(c) Evaluate $\int (\bar{z})^2\, dz$ along the real axis from 0 to 2 & then vertically from 2 to $2 + i$.

Que: 5 **(11)**

(A) If $P(A) = \frac{1}{2}, P(B') = \frac{1}{3}$ and $P(A \cap B) = \frac{1}{4}$ then find $P(A \cup B)$ and $P(A' \cap B')$

(B) Solve: $(D^3 - 6D^2 + 11D - 6)y = e^{-2x} + e^{-3x}$

(c) By variation of parameter methods solve: $(D^2 + 4)y = \sec 2x$

OR

Que: 5 **(11)**

(A) Solve : $(D^2 - 2D + 1)y = \cos 3x$

(B) Solve: $x^2 \frac{d^2y}{dx^2} - 4x \frac{dy}{dx} + 6y = x$

(c) Solve: (1) $(D^2 + D - 6)y = e^{2x}$ (2) $(D^2 + 1)y = x^2 + 2x + 1$

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

(A) Obtain Partial Differential Equation by elliminating arbitrary constants from:

(1) $z = (x-a)^2 + (y-b)^2$ (2) $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$

(B) Form Partial Differential Equation by elliminating arbitrary function from:

$\phi\, [x + y + z, x^2 + y^2 + z^2] = 0$

(c) Solve the Lagrange's equation : $\left(\frac{y^2 z}{x}\right) p + (zx) q = y^2$

(D) Solve by the method of separation of variable: $2x \cdot \frac{\partial z}{\partial x} - 3y \cdot \frac{\partial z}{\partial y} = 0$

End of Paper