Student Exam No._____

GANPAT UNIVERSITY

B. Tech. Semester: III Electrical Engineering

Regular Examination November – December 2013

2HS301 - ENGINEERING MATHEMATICS - III - Theory

Time: 3 Hours **Total Marks: 70**

Instruction: 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) 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 $y''' + 2y'' - y' - 2y = 0$, $y(0)=1$, $y'(0)=2$, $y'(0)=2$

Que-1 Answer the following. 12

(a) Derive $L\{Sin\,at\}$ and Evaluate: $L\left\{\frac{Sin\,at}{t}\right\}$

(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 $y'' + 4y = Sin\,t$, $y(0)=1$, $y'(0)=0$

Que-2 Answer the following. 11

(a) Find a Fourier series to represent: $f(x) = \pi^2 - x^2$, $-\pi \le x \le \pi$ 3

(b) Find a Fourier series for the function define as $f(x) = \begin{cases} -x-\pi & ; \ -\pi \le x \le 0 \\ x+\pi & ; \ 0 \le x \le \pi \end{cases}$ 4

(c) Find a series of sine multiples of x which present $f(x)$ in the interval $(0, \pi)$ where 4

$$f(x) = \begin{cases} \frac{\pi x}{4} & ; \ 0 \le x \le \frac{\pi}{2} \\ \frac{\pi x}{4}(\pi - x) & ; \ \frac{\pi}{2} \le x \le \pi \end{cases}$$

OR

Que-2 Answer the following. 11

(a) Obtain the Fourier series to represent the function $f(x) = x^2$, $-\pi \le x \le \pi$ 3

(b) Expand $f(x) = x \cdot \sin x$ as a Fourier series in the interval $[-\pi, \pi]$ 4

(c) Find a series of cosine multiples of x which present $f(x)$ in the interval 4

$[0, \pi]$ where $f(x) = \begin{cases} x & ; \ 0 \le x \le \frac{\pi}{2} \\ \pi - x & ; \ \frac{\pi}{2} \le x \le \pi \end{cases}$

Que-3 Attempt any three. 12

(a) Find a Fourier transform of $f(x)=\begin{cases}1-x^2 & ; \ |x|\le 1\\ 0 & ; \ |x|>1\end{cases}$

(b) Find a Fourier sine transform of $\frac{e^{-ax}}{x}$

(c) In a group of 200 students 40 are taking English, 50 are taking Mathematics, and 12 are taking both. A student is selected at random, those taking Mathematics. What is the probability that the student is taking English?

(d) For two independent event A and B if $P(A)=0.3$ and $P(A\cup B)$ then find $P(B)$

Section-II

Que-4 Answer the following. 12

(a) Define Analytic function. Discuss the analyticity of $f(z)=\bar{z}^2$ and find $f'(z)$ if it exists.

(b) Show that the function $u=\sin x\cosh y$ is harmonic function and determine its conjugates.

(c) Find the image of infinite strip $\frac{1}{4}\le y\le\frac{1}{2}$ under the transformation $w=\frac{1}{z}$. Also show the region graphically.

OR

Que-4 Answer the following. 12

(a) Verify that the function $(x^2-y^2+2xy)+i(y^2-x^2+2xy)$ is an analytic.

(b) Find an analytic function f(z)=u+iv, if $u-v=e^x(\cos y-\sin y)$

(c) Find the Bilinear transformation which maps the points $z=-1,1,\infty$ in to $w=-i,-1,i$.

Que-5 Answer the following. 11

(a) Solve: $\frac{d^2y}{dx^2}-5\frac{dy}{dx}+6y=e^{4x}$. 3

(b) Solve: $(D^2+D)y=x^2+2x+4$. 4

(c) Use the method of variation of parameters to solve $y''+y=\sec x$ 4

OR

Que-5 Answer the following. 11

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

(b) Solve: $(D-2)^3y=x^2e^x$ 4

(c) Solve: $x^2\frac{d^2y}{dx^2}+4x\frac{dy}{dx}+2y=\log x$ 4

Que-6 Attempt any three. 12

(a) Evaluate $\oint_C\frac{e^{2z}}{(z+1)^4}dz$ where C is the circle $|z|=4$

(b) State the Cayley-Hamilton theorem and find A^{-1} for $A=\begin{bmatrix}2&1&1\\0&1&0\\1&1&2\end{bmatrix}$

(c) If $A=\begin{bmatrix}2+i&3&-1+3i\\-5&i&4-2i\end{bmatrix}$, show that A*A is a Harmitian matrix.

(d) Define : (1) Hermitian matrix (2) Skew- Hermitian matrix (3) Unitary Matrix

End of Paper