Exam No.____________

GANPAT UNIVERSITY

B.TECH.SEMESTER – III(EE) CBCS(NEW) REGULAR EXAMINATION NOV – DEC 2015

2HS303: Mathematics for Electrical Engineering

TIME: 03 HRS

TOTAL MARKS: 60

Instruction:

1. This question paper has two sections. Attempt each section in separate answer book
2. Figures on right indiacte marks.
3. Be precise and to the point in answering the descriptive question.

SECTION – I

Que – 1

(A) Evaluate : (i) $L\{\sin 2t \cos 2t\}$ (ii) $L^{-1}\left\{\frac{s+5}{s^2-4s+13}\right\}$ (4)

(B) Using Convolution theorem ; Evaluate $L^{-1}\left\{\frac{1}{s\,(s+1)}\right\}$. (3)

(C) Evaluate : (i) $L\left\{\frac{\cos 2t - \cos 3t}{t}\right\}$ (ii) $L\{\,t\cos(3t+4)\,\}$ (3)

OR

Que – 1

(A) Evaluate : $L^{-1}\left\{\log\left(\frac{s-7}{s+3}\right)\right\}$ (4)

(B) Define Unit step Function . Express the given function in terms of unit step function and hence obtain its Laplace transforms $f(t) = \begin{cases} 0 \;;\; t<3 \\ t \;;\; t \geq 3 \end{cases}$ (3)

(C) Evaluate : $\int_0^{\infty} t\,e^{-2t}\sin 4t\;dt$ By using Laplace transform (3)

Que – 2

(A) Obtain Fourier series for $f(x) = \begin{cases} -k \;;\; -\pi < x < 0 \\ k \;;\; 0 < x < \pi \end{cases}$. (4)

(B) Obtain Fourier series for $f(x) = \sqrt{1-\cos x}$; $0 < x < 2\pi$. (3)

(C) Obtain Fourier series for $f(x) = \pi^2 - x^2$; $-\pi \leq x \leq \pi$. (3)

Hence deduce that $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \ldots\ldots$

OR

Que – 2

(A) Prove for $-\pi < x < \pi$; $\cos ax = \dfrac{2a \sin a\pi}{\pi}\left[\dfrac{1}{2a^2} + \sum_{n=1}^{\infty}\dfrac{(-1)^{n+1}}{n^2 - a^2}\cos nx\right]$ (4)

(B) Obtain Half range Cosine series for $f(x) = \begin{cases} 0 & ; \; 0 < x < \pi/2 \\ \pi/2 & ; \; \pi/2 < x < \pi \end{cases}$. (3)

(C) Obtain a Fourier series for $f(x) = e^{ax}$; $-\pi < x < \pi$. (3)

Que – 3

(A) Express following function as a Fourier integral : $f(x) = \begin{cases} 1 & ; \; |x| \le 1 \\ 0 & ; \; |x| > 1 \end{cases}$. (5)

Hence evaluate : $\displaystyle\int_0^{\infty} \frac{\sin\lambda \cos\lambda x}{\lambda}\, d\lambda$.

(B) Solve $\dfrac{d^2y}{dx^2} + 2\dfrac{dy}{dx} - 3y = 0$; $y(0) = 0, y'(0) = 4$ by Laplace method . (5)

OR

(B) Evaluate : $L^{-1}\left\{\dfrac{5s+3}{(s-1)(s^2+2s+5)}\right\}$ (5)

SECTION – II

Que – 4

(A) Solve: (i) $(D^2+9)(D^2+1)y = \cos 3x$ (ii) $(D-2)^2 y = e^{2x}$ (4)

(B) Solve: $(D^2+1)y = \sec x \cdot \tan x$ using method of variation of parameter. (3)

(C) Solve: $\dfrac{d^2y}{dx^2} + \dfrac{1}{x}\dfrac{dy}{dx} = \dfrac{12 \log x}{x^2}$ (3)

OR

Que – 4

(A) Solve: $(1+x^2)y'' + (1+x)y' + y = 2\sin[\log(1+x)]$ (4)

(B) Solve the given simultaneous equations $\dfrac{dx}{dt} = 2y, \dfrac{dy}{dt} = 2z, \dfrac{dz}{dt} = 2x$ (3)

(C) Solve: $\dfrac{d^2x}{dt^2} + 5\dfrac{dx}{dt} + 6x = 0$ given that $x(0) = 0$ and $\dfrac{dx}{dt}(0) = 15$ (3)

Que – 5

(A) State Cauchy's Integral formula & find $\oint_C \frac{\cos 2\pi z}{(z-1)(z-3)}\, dz\ ; C: |z| = \frac{7}{2}$ (4)

(B) Construct an analytic function whose real part is $2x(1-y)$. (3)

(C) Find find fixed points, normal form and decide the type of $w = \frac{5z+4}{z+5}$ (3)

OR

Que – 5

(A) Check the analyticity of sinhz and coshz. (4)

(B) If T_1 and T_2 are bilinear transformation then prove that $T_2{}^\circ\, T_1$ is also a biinear transformation. (3)

(C) Evaluate $\oint_C (\bar{z})^2\ dz$ along the path $y = x$ between 0 to $1 + i$. (3)

Que – 6 Attempt any two

(A) Find $Z(n \cdot e^{an})$ and $Z(n^2 \cdot e^{an})$ using damping rule. (5)

(B) In a bolt factory machines A, B and C manufacture 25%, 35% and 40% of the total. Of their output 5%, 4% and 2% are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured by machine A? (5)

(C) (i) If $P(A) = 0.33$, $P(B') = 0.25$ and $P(A \cap B) = 0.2$ then find $P(A' \cap B')$ (5)

(ii) Show that the function $\sin x \cdot \cosh y$ is harmonic function.

END OF PAPER