Exam No. ____________

GANPAT UNIVERSITY

B. Tech. Semester – IV (CE/IT) CBCS (NEW) Regular Examination April - June 2016

Sub: (2HS401) Mathematics for Computer Engg. & Information Tech.

TIME: 03 Hrs **TOTAL MARKS : 60**

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

(A) Evaluate : (i) $L\{e^t \cos 4t \cos 2t\}$ (ii) $L^{-1}\left\{\frac{s+7}{s^2+2s+1}\right\}$ (4)

(B) State convolution theorem & apply it to evaluate : $L^{-1}\left\{\frac{1}{(s-7)(s+3)}\right\}$. (3)

(C) If $L\{f(t)\} = \overline{f(s)}$ then Prove that : $L\{t^n f(t)\} = (-1)^n \frac{d^n}{ds^n}\{\overline{f(s)}\}$. (3)

OR

Que – 1

(A) Evaluate : (i) $L\left\{\frac{e^{-2t}-e^{-3t}}{t}\right\}$ (ii) $L\{t \cos 4t\}$ (4)

(B) Express the given function in terms of unit step function and hence obtain its Laplace transforms : $f(t) = \begin{cases} \sin t \ ; & t < \pi \\ t \ ; & t \geq \pi \end{cases}$ (3)

(C) Evaluate : $L^{-1}\left\{\log\left(\frac{s-2}{s+5}\right)\right\}$ (3)

Que – 2

(A) Expand $f(x) = x + x^2$ as a fourier series in the range $-\pi \leq x \leq \pi$. (4)

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

(B) Obtain Fourier series for $f(x) = \begin{cases} -k \ ; & -1 < x < 0 \\ k \ ; & 0 < x < 1 \end{cases}$. (3)

(C) Expand $f(x) = e^{-x}$; $-l \leq x \leq l$ as a fourier series . (3)

OR

Que – 2

(A) An alternating current after passing through a rectifier has the form : (4)

$$i(x) = \begin{cases} I_0 \sin x & ; 0 < x < \pi \\ 0 & ; \pi < x < 2\pi \end{cases}$$

I_0 is the maximum current & period is 2π . Express $i(x)$ as a Fourier series

(B) Obtain Half range Cosine series for $f(x) = x$ in the range $0 \le x \le 2$. (3)

(C) Obtain Fourier series for $f(x) = \begin{cases} 1 + x & ; -1 < x < 0 \\ 1 - x & ; 0 < x < 1 \end{cases}$ (3)

Que – 3 **Attempt any two** (10)

(A) Obtain the fourier transform of : $f(x) = \begin{cases} 1 & ; |x| \le 1 \\ 0 & ; |x| > 1 \end{cases}$.

Hence evaluate : $\int_0^{\infty} \frac{\sin x}{x}\, dx$.

(B) Solve : $\frac{dy}{dt} + 2y = 10\, e^{3t}$; $y(0) = 6$ by Laplace transform method .

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

SECTION – II

Que – 4 (10)

(A) If $f(z) = u + i v$ is an analytic function of z then find $f(z)$ if :
$u - v = (x - y)(x^2 + 4xy + y^2)$.

(B) Evaluate : $\int_0^{1+i} (x^2 + i y)\, dz$; Along (i) the line $y = x$ and (ii) $y = x^2$.

OR

Que – 4 (10)

(A) Find the bilinear transformation which maps the points $Z = 1, i, -1$ onto the points $W = i, 0, -i$.

(B) Evaluate : $\int_C \frac{\cos \pi z^2 + \sin \pi z^2}{(z - 1)(z - 2)}\, dz$; where C is the circle : $|z| = 5$.

Que – 5

(A) Find a root of the equation : $x \sin x + \cos x = 0$ using Bisection method up to two decimal places . (04)

Using Newton Raphson method ; Find a real root of the equation : (03)

$x^4 - x - 9 = 0$ up to three decimal places.

(C) Apply 4^{th} order R – K method to find approximate value of y at $x = 0.2$; (03)

given that ; $\frac{dy}{dx} = \frac{y-x}{y+x}$; $y(0) = 1$.

OR

Que – 5

(A) Find a real root of the equation : $x^3 - 2x - 5 = 0$ by False – Position method up to three decimal places. (04)

(B) Evaluate : $\int_0^6 \frac{dx}{1+x^2}$ using Trapezoidal & Simpson's 3/8 rule. (03)

(C) Using Eulers method find an approximate value of y corresponding to $x = 1.0$: (03)

Given that : $\frac{dy}{dx} = 2x + y$; $y(0) = 1$.

Que – 6 **Attempt any two** (10)

(A) Apply Gauss – Seidal method to solve : $\begin{cases} 5x + 2y + z = 12 \\ x + 4y + 2z = 15 \\ x + 2y + 5z = 20 \end{cases}$

(B) From the following table ; estimate the number of students who obtained marks between 40 and 45 .

Marks	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
No. of Stud.	31	42	51	35	31

(C) The following table gives some relations between Steam pressure (P) and Temperature (T). Find the pressure at temp. 372° by Lagranges interpolation formula

T	361°	367°	378°	387°	399°
P	154.9	167.0	191.0	212.5	244.2

END OF PAPER