Exam No._____

GANPAT UNIVERSITY

B.TECH.SEMESTER – III(BM&I) CBCS(NEW) REGULAR EXAMINATION NOV – 2015

2HS304: Mathematics for Biomedical 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) Find the laplace transform of the function $\frac{1}{s(s+1)}$ (4)

(B) Find: (i) $L\{e^{-2t}(2cos5t - 3sin3t)\}$ (ii) $L\{t^2 \cdot sinat\}$ (3)

(C) Evaluate $L^{-1}\left\{log\left(\frac{s+a}{s+b}\right)\right\}$ (3)

OR

Que – 1

(A) Express the function in terms of unit step function and find its laplace transform. $f(x) = \begin{cases} t-1 ; 1 < t < 2 \\ 3-t ; 2 < t < 3 \end{cases}$ (4)

(B) Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 3y = 0$ when $y(0) = 0$ and $y'(0) = 4$ (3)

(C) Using laplace transform evaluate $\int_0^\infty e^{-2t} \cdot t \cdot sin4t \, dt$ (3)

Que – 2

(A) Obtain fourier series for $f(x) = e^{-x} ; 0 < x < 2\pi$ (4)

(B) Find fourier series of $f(x) = x + x^2$ where $x \in (-\pi, \pi)$ (3)

(C) Find fourier series $f(x) = \begin{cases} 0 & ; -\pi < x < 0 \\ x^2 & ; 0 < x < \pi \end{cases}$ (3)

OR

Que – 2

(A) *Obtain fourier series of* $f(x) = cosax \;;\; -\pi < x < \pi$ (4)

(B) *Find forier series in the interval* $(0, 2)$ *for* $f(x) = \begin{cases} 2 & ; \; -2 < x < 0 \\ x & ; \; 0 < x < 2 \end{cases}$ (3)

(C) *Find half range cosine series for* $f(x) = x^2 \;;\; x \in (0, 2)$ (3)

Que – 3 ***Attempt any two***

(A) *By using convolution theroem find the laplace inverse of* $\frac{1}{s^2(s+1)^2}$ (5)

(B) *Find fourier sine transform of* $\frac{e^{-ax}}{x}$ (5)

(C) *Express the given function as a fourier transform* $f(x) = \begin{cases} 1 & ; \; |x| \leq 1 \\ 0 & ; \; |x| > 1 \end{cases}$ (5)

and hence evaluate $\int_0^\infty \frac{sinx}{x}\, dx$

SECTION – II

Que – 4

(A) *Check the analyticity of* (i) z^7 (ii) $\bar{z}$ (4)

(B) *Find fixed points , normal form and decide the type of* $w = \frac{z}{z-2}$ (3)

(C) *Evaluate* $\oint_C \frac{sin3\pi z}{(z-1)(z-2)} dz \;;\; C: |z| = 2.5$ (3)

OR

Que – 4

(A) *Prove that* $\oint_C (z-a)^n dz = 0$ [*n is an integer* $\neq -1$] (4)

(B) *State and prove Cauchy's theorem for contour integration.* (3)

(C) *State and prove maximum – minimum modulus theorem.* (3)

Que – 5

(A) *Use R – K method to find an approximate solution of y at* $x = 1.2$ *for* $y' = x^2 + y^2$ *given that* $y = 1.5$ *when* $x = 1$ *with* $h = 0.2$ (4)

(B) Solve following equations using Gauss – ellimination method. (3)

$2x + y + z = 10\,, 3x + 2y + 3z = 18\,, x + 4y + z = 16$

(C) Evaluate $\int_0^5 \frac{dx}{1+3x}$ with $h = 1$ using simpson's one – third rule. (3)

OR

Que – 5

(A) Find the real root of $x^4 - x - 9 = 0$ correct upto three decimal places using Newton – Raphson method. (4)

(B) Find first and second order derivative at $x = 4$ for given data. (3)

x	1.5	2	2.5	3	3.5	4
$y = f(x)$	3.375	7	13.625	24	38.875	59

(C) Compute $y(0.5)$ for $y' = x + y^2\,; y(0) = 1$ & $h = 0.1$ by Euler's method. (3)

Que – 6 **Attempt any two**

(A) Find real root of $x^3 - 3x - 5 = 0$ upto 5th approximation by using Bisection method. (5)

(B) Find residues of the function $f(z) = \frac{2z+3}{(z+1)^2(z-3)}$ (5)

(C) Find an analytic function whose real part is $e^x cosy$, find corresponding harmonic conjugate. (5)

END OF PAPER