

GANPAT UNIVERSITY
B. TECH SEM- III (EC) CBCS(New) REGULAR EXAMINATION– NOV-DEC 2016
(2HS302) Mathematics for Electronics and Communication Engineering

TIME: 3 HRS

TOTAL MARKS: 60

- Instructions:** (1) This Question paper has two sections. Attempt each section in separate answer book.
 (2) Figures on right indicate marks.
 (3) Be precise and to the point in answering the descriptive questions.

SECTION: I

Q.1 Answer the following

- (a) Using convolution theorem evaluate $L^{-1}\left(\frac{1}{(s+1)(s^2+1)}\right)$ 4
- (b) Evaluate $L^{-1}\left\{\log\left(\frac{s^2+1}{(s-1)^2}\right)\right\}$ 3
- (c) Evaluate $L\{te^{2t}\cos 3t\}$ 3

OR

Q.1 Answer the following

- (a) Using Laplace transform solve $4y'' - 4y' + 37y = 0, y(0) = 3, y'(0) = 1.5$ 4
- (b) Find Laplace transform of the saw tooth wave function defined by $f(t) = \frac{k}{p}t, 0 < t < p,$
 $f(t+p) = f(t) \forall t$ 3
- (c) Find Laplace transform of $f(t) = \begin{cases} e^t, & 0 \leq t < 5 \\ 3, & t \geq 5 \end{cases}$ 3

Q.2 Answer the following

- (a) Determine the analytic function whose real part is $e^{2x}(x\cos 2y - y\sin 2y)$ 4
- (b) Evaluate $\int_0^{1+i} (x^2 + iy) dz$ along the path $y = x^2$. 3
- (c) Evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$ where $C: |z| = 3$ 3

OR

Q.2 Answer the following

- (a) Find a bilinear transformation which maps the points $z = 1, i, -1$ onto the points $w = i, 0, -i$ 4

- (b) Check whether the function $w = z^{\frac{5}{2}}$ is analytic or not? 3
- (c) Evaluate $\int_C \frac{e^z}{(z+1)^2} dz$ where $C: |z| = 2$ 3

Q.3

- (a) Evaluate $L^{-1}\left(\frac{1}{s^4 - 2s^3}\right)$ 4
- (b) Attempt any two 6
- I Evaluate $L\left(\frac{1-e^t}{t}\right)$
- II Evaluate $\oint_C \frac{\cos \pi z^2}{(z-1)(z-2)} dz$ where C is the circle $|z| = 3$
- III Evaluate $\int_C \frac{z^2 - z + 1}{z-1} dz$ where C is the circle $|z| = \frac{1}{2}$

SECTION: II

Q.4 Answer the following

- (a) By Picard method solve numerically $\frac{dy}{dx} = 2x - y$, $y = 0.9$ when $x = 0$, at $x = 0.2$ up to three iteration. 4
- (b) Find cube root of 11 up to four decimal places by Newton's Raphson method. 3
- (c) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ with $h=1$ using Trapezoidal rule. 3

OR

Q.4 Answer the following

- (a) Apply R-K 4th order method to find an approximation value of y when $x = 0.2$ given that $\frac{dy}{dx} = x + y$ and $y(0) = 1, h = 0.2$. 4
- (b) Find root of equation $2x - \log_{10} x = 7$ which lies between 3.5 and 4 by Regula falsi method up to three decimal places. 3
- (c) Use Jacobi's method to solve
$$\begin{aligned} 20x + y - 2z &= 17, \\ 3x + 20y - z &= -18, \\ 2x - 3y + 20z &= 25 \end{aligned}$$
 3

Q.5 Answer the following

- (a) Find value of y when $x = 90$ from the following observation table 4

x	100	150	200	250	300	350	400
y	10.63	13.03	15.04	16.81	18.42	19.90	21.27

- (b) Find a cubic polynomial which takes the following values. Hence evaluate $f(4)$. 3

x	0	1	2	3
$f(x)$	1	2	1	10

- (c) Compute $f(10)$ using Lagrange's interpolation formula from following data. 3

x	5	6	9	11
$f(x)$	12	13	14	16

OR

Q.5 Answer the following

- (a) Prove that (i) $E = e^{hD}$ (ii) $E\nabla = \Delta$ 4

- (b) Using Newton's divided difference formula find a polynomial of degree which fit into the data below. 3

x	-1	0	1	3
y	2	1	0	-1

- (c) Using Newton forward interpolation formula find y at $x = 4$ from the following table 3

x	0	5	10	15	20	25
y	7	11	14	18	24	32

Q.6

- (a) From following tabulated values of x and y find $\frac{d^2y}{dx^2}$ for $x = 1.25$ 4

x	1	1.05	1.10	1.15	1.20	1.25	1.3
y	1	1.0247	1.04881	1.07238	1.09544	1.11803	1.14017

- (b) Attempt any two 6

I Evaluate $\int_4^{5.2} \log_e x \, dx$ with $h = 0.2$ using Simpson's 1/3 rule.

II For given $y_{35.0}=1175$, $y_{35.5}=1280$, $y_{39.5}=2180$, $y_{40.5}=2420$, find y_{40} by Newton's divided difference formula.

III Prove that $\frac{\Delta}{\nabla} - \frac{\nabla}{\Delta} = \Delta + \nabla$

END OF PAPER