Seat Number

April 2014

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खजिना - 028 / 029

MATHEMATICS PAPER - III : MTH - 123
(A) Laplace Transforms (12117) OR / (B) Computational Mathematics (12118)

P. Pages : 4

(A) Laplace Transforms (12117)

Time : Two Hours **Max. Marks : 40**

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. Figures to the right indicates full marks.

1. Attempt **any eight** of the following. **8**

i) Find L $(t^n . F(t))$

ii) Find $\beta(1, 1)$.

iii) Find L (cosh 4t +1).

iv) Find $L^{-1}\left(\frac{1}{s^7}\right)$.

v) Cost and sint are periodic function with period.....

vi) Find $L^{-1}\left(\frac{1}{s^2-4}\right)$

vii) Find $L^{-1}\left(\frac{1}{2s+5}\right)$

viii) If $\int_0^t F(u) \cdot G(t-u)\, du = F * G$ then $G * F$ is.....

ix) Define Heaviside's unit step function U (t - q).

x) Find $\lceil 6$.

2. a) Attempt **any two** of the following. **6**

i) Prove that L(F(t)) = f(s) then prove that $L\left(e^{at} \cdot f(t)\right) = f(s-a)$

ii) Find $L\left(4e^{5t} + 6t^3 - 3\sin 4t + 2\cos 2t\right)$.

iii) Find L $(t \cdot \cosh 3t)$

b) Using $L(F'(t)) = Sf(s) - F(0)$ show that $L(t) = \frac{1}{s}$. **2**

3. Attempt **any two** of the following. **8**

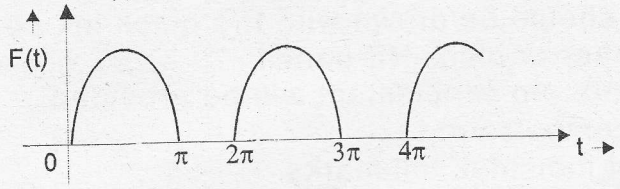
i) If $L^{-1}(f(s))=F(t)$ then $L^{-1}(f(ks)) = \frac{1}{K} F\left(\frac{t}{K}\right)$

ii) Find $L^{-1}\left(\frac{12}{4-3s}\right)$.

iii) Find $L^{-1}\left(\frac{6s-4}{s^2-4s+20}\right)$.

4. a) Attempt **any two** of the following. **6**

i) Find F (t) from the graph given below with period $T = 2\pi$.



ii) Find $L^{-1}\left(\frac{3s+7}{(s-3)(s+1)}\right)$.

iii) Find $L^{-1}\left(\frac{1}{(s^2+1)(s+1)}\right)$. use convolution theorem.

b) Show that $|*|*|*----*|$ (n times) $= \frac{t^{n-1}}{(n-1)!}$ n = 1, 2, 3..... **2**

5. i) Prove that $L(U(t-a)) = \frac{e^{-as}}{s}$ **4**
Where U (t - a) is Heaviside's unit step function.

ii) Find $L(\sin 2t\ \delta(t-3))$ **4**

OR

i) Using Laplace transform, solve $y'' + y = \cos t$ where $y(0) = 0 = y'(0)$. **4**

ii) Using Laplace transform solve **4**
$\frac{d^2y}{dt^2} + 9y = 0$ subject to the condition $y(0) = 1, y'(0) = 0$.

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(B) Computational Mathematics (12118)

Time : Two Hours **Max. Marks : 40**

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. Figures to the right indicate full marks.
6. Use of calculator is allowed.

1. Attempt **any eight** of the following. **8**

i) Define Discrete Numeric function.

ii) Define S_a^{-i} for the numeric function a.

iii) If numeric function $a_r = 7 \ \forall \ r \geq 0$ then A(z)=.....

iv) If f (x) is divisible by x - a then a is the root of f (x) =.....

a) - 1 b) 1

c) 0 d) None of these

v) The root of the equation $x^3 - x - 4 = 0$ lies between.....

a) 1 and 2 b) -1 and -2

c) 0 and 1 d) None of these

vi) Define optimal strategy.

vii) What is mean by unfair game?

viii) Define 'Value of the game'.

ix) What is processing time?

x) Define 'Ideal Time'.

2. a) Attempt **any two** of the following. **6**

i) If A (z) and B (z) are generating functions of numeric functions a and b respectively then show that.

$A(z) + B(z) = C(z)$ for $c = a + b$ and

$A(z) \cdot B(z) = D(z)$ for $d = a \cdot b$.

ii) let $a_r = \begin{cases} 1 & \text{if } 0 \leq r \leq 2 \\ 3r & \text{if } r \geq 3 \end{cases}$ and $b_r = \begin{cases} 2^r + 1 & \text{if } 0 \leq r \leq 1 \\ r - 5 & \text{if } r \geq 2 \end{cases}$

Find $a_r + b_r$ and $a_r \cdot b_r$

iii) Determine the generating function of numeric $a_r = 3^r + 4^{r+1}$

b) Find the generating function of 2, 4, 8, 16, 32,..... **2**

3. Attempt **any two** of the following. **8**

i) Explain Newton-Raphson method to find the root of f (x) = 0.

ii) Find the root of $x^3 - 2x - 5 = 0$ by Regula - Falsi method up to three iterations.

iii) Find the real root of $x^3 - x - 1 = 0$ by Bisection method. Perform three iterations.

4. a) Attempt **any two** of the following. 6

i) Explain solving 2×2 game by mixed strategy method.

ii) Solve the following game by saddle point method.

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	6	3	1	20
	A_2	5	5	4	6
	A_3	4	−2	0	−5

iii) Solve the following game by using the rule of Dominance.

		Plyear B		
		B_1	B_2	B_3
Player A	A_1	6	−3	7
	A_2	−3	5	4
	A_3	1	1	7

b) Define Pay - off Matrix. 2

5. a) i) Explain the procedure to find optimal sequence of n jobs on two machines. 4

ii) Find an optimal sequence for the following problem for machines M_1, M_2 and M_3. 4

Job	J_1	J_2	J_3	J_4	J_5	J_6
M_1	15	10	14	9	12	9
M_2	10	11	12	9	8	13
M_3	15	14	13	16	17	16

OR

i) Explain the assumptions which are generally made in sequencing problem. 4

ii) Six jobs are to be performed on machine & then on machine B. 4
The processing time for each job is given below.

Time (in minutes)

Job	I	J	K	L	M	N
A	8	12	7	10	11	9
B	10	7	11	6	12	8

Find optimal sequence of jobs.

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