Oct-2014

Seat Number

0201

कानन - 031 / 032

MATHEMATICS PAPER - III : MTH-123
(A) Laplace Transforms (12117) / (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. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same 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 right indicates full marks.

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

i) Define Laplace transform of F(t).

ii) Find $L(a.e^{at})$

iii) Find $\lfloor 5/2$.

iv) Find $L^{-1}\left(\frac{1}{S^4}\right)$

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

vi) By convolution theorem $L^{-1}(f(s).g(s)) = -----$

vii) Write $L(\delta(t-a))$, where $\delta(t-a)$ is Dirac-delta function.

viii) Find $L(t'')$

ix) Find $L\left(\frac{\sin 4t}{5}\right)$

x) Write $L\left(t^n \cdot F(t)\right)$.

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

i) Prove that $L(\cosh at) = \frac{S}{S^2 - a^2}$ if $s > |a|$.

ii) Find $L(4t^2 - 3\cos 2t + 5e^{-t})$

iii) Find $L(t^2 . e^{2t})$

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

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

i) If $L^{-1}(f(s)) = F(t)$ then show that $L^{-1}(f(s-a)) = e^{at} \cdot F(t)$.

ii) Find $L^{-1}\left(\frac{3S-18}{S^2+4} - \frac{4S-24}{S^2-16}\right)$

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

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

i) $F(t)$ have period $T > 0$ then $L(F(t)) = \frac{1}{1-e^{-ST}} \int_0^T e^{-ST} . F(t).dt$

ii) Find $L^{-1}\left(\frac{3S+16}{S^2-S-6}\right)$

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

b) Graph the function $F(t) = \begin{cases} 3t, & 0 < t < 2 \\ 6, & 2 < t < 4 \end{cases}$ where $F(t)$ is period with $T = 4$. **2**

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

ii) Find $L(t^3 U(t-2))$. **4**

OR

i) Solve $y'' + y = t$ given that $y'(0) = 0$ and $y(\pi) = 0$. **4**

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

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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. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same 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 right indicates full marks.
6. Use of calculator is allowed.

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

i) Define generating function.

ii) If numeric function $a_r = 2$ if $r \geq 0$ then A(Z) = --------

iii) Define Asymptotic dominance.

iv) The root of the equation $xe^x = 1$ lies between

a) -1 and -2 b) 0 and 1

c) 0 and -1 d) none of these

v) Newton Raphson formula for square root of N is,

a) $x_{n+1} = \frac{1}{2}\left[x_n - \frac{N}{x_n}\right]$ b) $x_{n+1} = \frac{1}{2}\left[x_n + \frac{N}{x_n}\right]$

c) $x_{n+1} = \frac{1}{2}\left[x_n + \frac{x_n}{N}\right]$ d) none of these

vi) What is fair game ?

vii) Define strategy.

viii) What is processing time ?

ix) What is no passing ?

x) Give one assumption of sequencing problem.

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

i) Prove that ${}^nC_r = {}^{n-1}C_r + {}^{n-1}C_{r-1}$

ii) Determine the generating of the numeric function

$a_r = r + 1$

$= S^r + 7^{r+1}$ for $r \geq 0$

iii) Determine the discrete numeric function $A(Z) = \frac{1}{1+Z}$.

b) Find generating of A(Z) of the numeric function $a_r = 5^r$ if $r \geq 0$. 2

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

i) Explain the method of false position to find the root of the equation f(x) = 0.

ii) Find square root of N correct to three decimal places by Newton Raphson formula if N = 10.

iii) Find the real root of the equation $x^3 - x - 1 = 0$ by bisection method perform three iteration.

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

i) Explain solving game by principle of dominance.

ii) Solve the following game graphically.

Player B

Player A	B_1	B_2	B_3
A_1	6	7	15
A_2	20	12	20

iii) Solve the following game by arithmetic method.

Player B

Player A	B_1	B_2
A_1	5	−4
A_2	−5	3

b) Define a pay off matrix. 2

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

ii) ABC manufacture has to process 7 items through two stages of production given by grinding and polishing the processing time in hours for each job given below. 4

Time (hours)

Job	A	B	C	D	E	F	G
Grinding M_1	8	10	6	7	9	10	15
Polishing M_2	5	9	10	8	12	8	11

OR

i) Explain the procedure to solve n jobs through three machines. 4

ii) Find the optimal sequence of jobs given 4

Processing Time (hours)

Job	J_1	J_2	J_3	J_4	J_5	J_6
A	12	10	9	14	7	9
B	7	6	6	5	4	4
C	6	5	6	4	2	4

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