

Total Marks:80
Duration: 3Hrs

NB 1. Question No.1 is compulsory

2. Attempt any three from the remaining six questions
3. Figures to the right indicate full marks

Q1 a If the Laplace Transform of $e^{-t} \int_0^t u \cos 2u \, du$ [20]

b Prove that $f(z) = \sinh z$ is analytic and find its derivative

c Obtain Half range Sine Series for $f(x) = x+1$ in $(0, \pi)$

d Find a unit vector normal to the surface $x^2y + 2xz = 4$ at $(2, -2, 3)$

Q2 a Prove that $\vec{F} = (2xy^2 + yz)i + (2x^2y + xz + 2yz^2)j - (2y^2z + xy)k$ is Irrotational.

Find Scalar Potential for \vec{F}

[6]

b Find the inverse Laplace Transform using Convolution theorem

$$\frac{(s-1)^2}{(s^2-2s+5)^2}$$

[6]

c Find Fourier Series of $f(x) = \begin{cases} \pi x; & 0 \leq x \leq 1 \\ \pi(2-x); & 1 \leq x \leq 2 \end{cases}$

[8]

Q3 a Find the Analytic function $f(z) = u + iv$ if $v = \frac{x}{x^2+y^2} + \cosh x \cos y$

[6]

b Find Inverse Z transform of $\frac{(3z^2 - 18z + 26)}{(z-2)(z-3)(z-4)}$, $3 < |z| < 4$

[6]

c Solve the Differential Equation $\frac{d^2y}{dt^2} + 2\frac{dy}{dx} + 2y = 5 \sin t$, $y(0) = 0$, $y'(0) = 0$ using Laplace Transform

[8]

Q4 a Find the Orthogonal Trajectory of $3x^2y - y^3 = k$

[6]

b Find the Z-transform of $2^K \sinh 3K$, $K \geq 0$

[6]

c Express the function $f(x) = \begin{cases} 1 & ; |x| < 1 \\ 0 & ; |x| > 1 \end{cases}$ as Fourier Integral. Hence evaluate $\int_0^\infty \frac{\sin \lambda}{\lambda} \cdot \cos(\lambda x) d\lambda$

[8]

Q5 a Evaluate using Stoke 's theorem $\int_C (2x - y)dx - yz^2 dy - y^2 z dz$ where C is the circle $x^2 + y^2 = 1$ corresponding to the sphere $x^2 + y^2 + z^2 = 1$ above the XY plane [6]

b Show that $w = \frac{2z + 3}{z - 4}$ maps the circle $x^2 + y^2 - 4x = 0$ into straight line $4u + 3 = 0$ [6]

c Find Inverse Laplace Transform i) $e^{-s} \tanh^{-1} s$ ii) $\frac{6}{(2s + 1)^3}$ [8]

Q6 a Find the Laplace transform of $f(t) = \frac{2t}{3}, 0 \leq t \leq 3, f(t+3) = f(t)$ [6]

b Find Complex Form of Fourier Series for $\sin(\alpha x); (-\pi, \pi), \alpha$ is not an integer [6]

c Verify Green's theorem for $\int_C (2x^2 - y^2)dx + (x^2 + y^2)dy$ where C is the boundary of the surface enclosed by lines $x=0, y=0, x=2, y=2$ [8]

SE/IT/Sem-III/CBSG

Dt - 24/5/2017

Q.P. Code: 552300

(3 Hours)

[Total Marks : 80

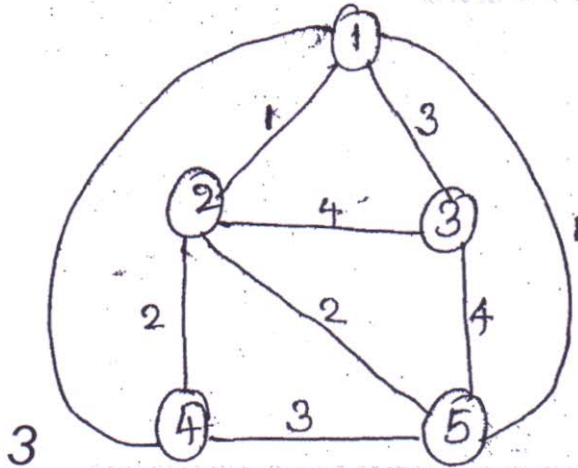
- N.B. : (1) Question No.1 is Compulsory.
 (2) Answer any three out of remaining questions.
 (3) Assume suitable data if necessary.
 (4) Figures to the right indicate full marks.

1. (a) Explain asymptotic notations. 3
- (b) What are linear and non-linear data structures. 3
- (c) What is recursion ? State its advantages and disadvantages. 3
- (d) What is expression tree ? Give examples. 3
- (e) What is depth, height and degree of Binary tree. 3
- (f) Define graph. List its types with examples. 3
- (g) Define minimum spanning tree. 2
2. (a) Write a program for implementing QUICK SORT and comment on its complexity. 10
- (b) Write a program for implementing STACKS using arrays. 10
3. (a) Construct the binary tree for the in order and pre-order traversal sequence given below :- 10
 IN ORDER:- ENGINEERING
 PRE ORDER :- E G N E N I I R E N G
- (b) Write functions to implement insert () and traverse () of singly linked-list. 10

[TURNOVER

Q.P. Code: 552300

4. (a) What is Minimum Spanning Tree? Draw the MST using kruskal and prim's Algorithm and find out the cost with all intermediate steps.

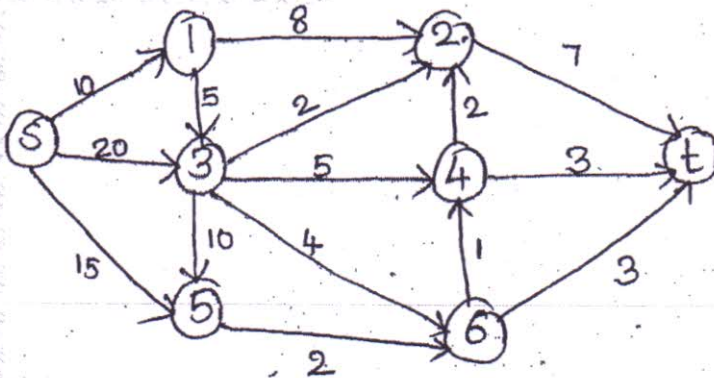


- (b) Write the algorithm for deletion of a node in Binary Search Tree. Explain all the three cases of traversals.

5. (a) Write an algorithm for the following operations on doubly linked list.

- (1) Insertion
- (2) Forward Traversal
- (3) Reverse Traversal

- (b) Find the shortest path using Dijkstra's Algorithm.



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3

6. Solve (Any Four)

- (1) Priority Queue
- (2) AVL Tree
- (3) BFS -Breadth First Search
- (4) Circular linked list
- (5) Insertion Sort
- (6) Red Black Trees.

20



