B.TECH. DEGREE EXAMINATION, NOVEMBER 2017

Fifth Semester

Branch : Information Technology

IT 010 505—LANGUAGE TRANSLATORS (IT)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours   Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 marks.

1. Differentiate interpreters and compilers. Give an example for each.

2. What are ambiguous grammars ? Give an example of an ambiguous grammar.

3. Compare L-attributed and S-attributed definition.

4. What are the issues in the design of a code generator ?

5. What do you mean by Data flow analysis ? What is its relevance in compiler design ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 marks.

6. Explain the concept of input buffering during lexical analysis.

7. What is left factoring ? What is the problem created by left factors ? How is it eliminated ?

8. Write the translation scheme for addressing array elements. Produce the three-address code for the following statement :

   $C = a + B[i, j]$.

9. Construct a Directed Acyclic Graph (DAG) for the basic block given below and simplify the three-address code using the DAG :

   $a = b + c$
   $b = a - d$
   $c = b + c$
   $d = a - d$.

10. Explain the principal sources of optimization.

(5 × 5 = 25 marks)

Turn over

Part C

*Answer **all** questions.*
Each full question carries 12 marks.

11. In the context of a compiler, briefly describe the output of each major compilation phase for the assignment statement $x = y * z + 5 + 8$, where x, y and z are real numbers. State any assumptions you make.

Or

12. Explain a lexical analyser generator. Write regular expressions for identifying numbers and identifiers, and draw transition diagrams for the same.

13. Show that the following grammar is LR(1) but not LALR(1) :

$S \rightarrow Aa \mid bAc \mid Bc \mid bBa$
$A \rightarrow d$
$B \rightarrow d$

Or

14. Consider the following grammar :

$S \rightarrow FR$
$R \rightarrow *S \mid E$
$F \rightarrow id$

Construct the predictive parser table M for the above grammar.

15. Explain the various methods of symbol table organization.

Or

16. What are type systems ? Explain the type checking in arithmetic expressions and assignment statements.

17. Write syntax directed translation to convert :

 (i) Assignment statement.

 (ii) Relational expression.

 (iii) For statements.

to three-address code.

Or

18. What are the functions of code generation ? Write a simple code generation algorithm. Show how the code is generated for the statement $w := (A - B) * (A - C - B) + (A - B - C)$. Assume only two registers are available.

19. Consider the following code fragment given below :

```
Begin
    for i := 1 to n do
    for j := 1 to n do
        C{i,j} := 0 ;
    for k : 1 to n do
        C{i,j} := C{i,j} + A[i,k] * B[k,j];
End
```

Perform the following :

 (i) Partition into Basic blocks.

 (ii) Find the loops in the flow graph.

 (iii) Perform code optimization.

Or

20. Explain Data flow analysis of structured flow graphs.

$(5 \times 12 = 60$ marks$)$

17. (a) $\dfrac{dy}{dx} = 2e^x - y,\ y(0) = 2,\ y(0.1) = 2.01,\ y(0.2) = 2.04,\ y(0.3) = 2.09$. Find y at 0.4 and 0.5

using Milne's predictor-corrector method.

(6 marks)

(b) Solve $\dfrac{dy}{dx} = \dfrac{1}{1+x^2} - 2y^2,\ y(0) = 0$ at $x = 0.5$ in 2 steps using Runge-Kutta 4th order method.

(6 marks)

Or

18. (a) Solve $\dfrac{dy}{dx} = x + y,\ y(1) = 0$ at 1.1 and 1.2 using Taylor series method. (6 marks)

(b) Find y at 1.2 and 1.4 using Euler's modified method given $\dfrac{dy}{dx} = x^2 + y,\ y(1) = 2.$ (6 marks)

19. (a) Use duality to solve :

Maximise $Z = 2x_1 + x_2$

subject to $x_1 + 2x_2 \le 10$

$x_1 + x_2 \le 6$

$x_1 - x_2 \le 2$

$x_1 - 2x_2 \le 1$

$x_1, x_2 \ge 0.$

(6 marks)

(b) Solve the following transportation problem :—

	Destination						
	D_1	D_2	D_3	D_4	D_5	D_6	Available
S_1	9	12	9	6	9	10	5
S_2	7	3	7	7	5	5	6
S_3	6	5	9	11	3	11	2
S_4	6	8	11	2	2	10	9
Requirements	4	4	6	2	4	2	

(6 marks)

Or

20. Apply MODI method to obtain solution of the transportation problem given below based on the data given :

	D_1	D_2	D_3	D_4	Supply
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	34

(12 marks)

[5 × 12 = 60 marks]

B.TECH. DEGREE EXAMINATION, NOVEMBER 2017

Fifth Semester

Common to all Branches Except C.S. and I.T.

EN 010 501 A—ENGINEERING MATHEMATICS—IV

(New Scheme—2010 Admission onwards)

[Supplementary]

Time : Three Hours   Maximum : 100 Marks

Part A

Answer all questions.
Each question carries 3 marks.

1. Show that the function $\dfrac{1}{2} \log\left(x^2 + y^2\right)$ is harmonic.

2. Find the poles and residues for $f(z) = \dfrac{z^2}{\left(z^2 + 3z + 2\right)^2}.$

3. Show that there is an order of convergence called quadratic for Newton's Raphson method.

4. Given $\dfrac{dy}{dx} = x + y,\ y(0) = 1$. Find $y(0.1)$ by Euler's method.

5. Construct the dual of the L.P.P.

Minimise $Z = 4x_1 + 14x_2 + 3x_3$

subject to $-x_1 + 3x_2 + x_3 \ge 3$

$2x_1 + 2x_2 - x_3 \ge 2$

$x_1, x_2, x_3 \ge 0.$

(5 × 3 = 15 marks)

Part B

Answer all questions.
Each question carries 5 marks.

6. Find the bilinear transformation which maps the points $z = 1,\ i, -1$ onto the points $w = i, 0, -i.$

Turn over

7. Expand $f(z) = \dfrac{1}{(z-1)(2-z)}$ as a Laurent series valid for $1 < |z| < 2$.

8. Find a root of $x^3 - 9x + 1 = 0$ in $(2, 4)$ by bisection method.

9. Find y at $x = 0.1$. Using Taylor series method to 5 decimal places $\dfrac{dy}{dx} = x^2 y - 1$, $y(0) = 1$.

10. Using Graphical method :

Maximize $Z = 3x_1 + 2x_2$

subject to $x_1 - x_2 \le 1$, $x_1 + x_2 \ge 3$, $x_1, x_2 \ge 0$.

$(5 \times 5 = 25 \text{ marks})$

Part C

*Answer any **one** full question from each module.*
Each full question carries 12 marks.

11. (a) Show that $u = x^2 - y^2 - \dfrac{x}{x^2 + y^2}$ is harmonic. Find its harmonic conjugate and the analytic

function $f(z)$ whose real part is u.

(6 marks)

(b) If $f(z)$ is analytic inside a circle c with, centre at a, then prove that for any z inside c,

$$f(z) = f(a) + (z - a) f'(a) + \frac{(z-a)^2}{2!} f''(a) + \dots + \frac{(z-a)^n}{n!} f^n(a) + \dots$$

(6 marks)

Or

12. (a) Find the images of the circles $|z| = 1$ and $|z| = 2$ under the mapping $w = z + \dfrac{1}{z}$. (6 marks)

(b) Evaluate $\displaystyle\int_C \dfrac{(z^2 + 5)}{(z-2)(z-3)}\, dz$ and C is the circle $|z| = 4$.

(6 marks)

13. (a) State Cauchy's integral theorem. Use the theorem to evaluate the $\displaystyle\oint_C \dfrac{dz}{z+2}$ where C is the unit

circle $|z| = 1$ traversed in the anti-clockwise direction.

(5 marks)

(b) Define the residue of a function at a pole. Derive an expression for residue at a pole of order n.

Hence computer the residues of $f(z) = \dfrac{z+1}{z^2(z-2)}$.

(7 marks)

Or

14. (a) Expand $f(z) = \dfrac{1}{(z+1)(z+3)}$ in Laurent's series valid for the region $1 < |z| < 3$. (6 marks)

(b) Using Residue theorem evaluate $\displaystyle\int_0^\pi \dfrac{a\,d\theta}{a^2 + \sin^2\theta}$.

(6 marks)

15. (a) Using regula-falsi method, find the root correct to 3 decimal places of the equation

$x^4 - x - 10 = 0$, given that root lies between 1.8 and 2.0.

(6 marks)

(b) Using Gauss -Seidel iteration method, solve the following system of equations :

$10x - 2y - z - u = 3$

$-2x + 10y - z - u = 15$

$-x - y - 10z - 2u = 27$

$-x - y - 2z + 10u = -9$

(6 marks)

Or

16. (a) Derive an iterative formula to find the square root of a number using Newton-Raphson method
and hence find $\sqrt{15}$.

(6 marks)

(b) Find the smallest positive root of $x^2 |\sin \sqrt{x}| = 5$ using Bisection method. Carry out 4 iterations.

(6 marks)

Turn over