

CBCS SCHEME

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18MAT31

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Transform Calculus, Fourier Series and Numerical Techniques

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Find the Laplace transform of:
- (i) $\left(\frac{4t+5}{e^{2t}}\right)^2$ (ii) $\left(\frac{\sin 2t}{\sqrt{t}}\right)^2$ (iii) $t \cos at$. (10 Marks)
- b. The square wave function $f(t)$ with period $2a$ defined by $f(t) = \begin{cases} 1 & 0 \leq t < a \\ -1 & a \leq t < 2a \end{cases}$. Show that $\left(\frac{1}{s}\right) \tanh\left(\frac{as}{2}\right)$. (05 Marks)
- c. Employ Laplace transform to solve $\frac{d^2y}{dt^2} - \frac{dy}{dt} = 0$, $y(0) = y_1(0) = 3$. (05 Marks)

OR

- 2 a. Find (i) $L^{-1}\left\{\frac{s^2 - 3s + 4}{s^3}\right\}$ (ii) $\cot^{-1}\left(\frac{s}{2}\right)$ (iii) $L^{-1}\left\{\frac{s}{(s+2)(s+3)}\right\}$ (10 Marks)
- b. Find the inverse Laplace transform of, $\frac{1}{s(s^2+1)}$ using convolution theorem. (05 Marks)
- c. Express $f(t) = \begin{cases} 2 & \text{if } 0 < t < 1 \\ \frac{t^2}{2} & \text{if } 1 < t < \frac{\pi}{2} \\ \cos t & t > \frac{\pi}{2} \end{cases}$ in terms of unit step function and hence find its Laplace transformation. (05 Marks)

Module-2

- 3 a. Obtain the Fourier series of $f(x) = \begin{cases} 2 & -2 < x < 0 \\ x & 0 < x < 2 \end{cases}$. (08 Marks)
- b. Find the half range cosine series of, $f(x) = (x+1)$ in the interval $0 \leq x \leq 1$. (06 Marks)
- c. Express $f(x) = x^2$ as a Fourier series of period 2π in the interval $0 < x < 2\pi$. (06 Marks)

OR

- 4 a. Compute the first two harmonics of the Fourier Series of
- $f(x)$
- given the following table :

x°	0	60°	120°	180°	240°	300°
y	7.9	7.2	3.6	0.5	0.9	6.8

- b. Find the half range size series of e^x in the interval $0 \leq x \leq 1$. (08 Marks)
 (06 Marks)
- c. Obtain the Fourier series of $f(x) = \frac{\pi^2}{12} - \frac{x^2}{4}$ valid in the interval $(-\pi, \pi)$ (06 Marks)

Module-3

- 5 a. Find the Infinite Fourier transform of $e^{-|x|}$. (07 Marks)
 b. Find the Fourier cosine transform of $f(x) = e^{-2x} + 4e^{-3x}$. (06 Marks)
 c. Solve $u_{n+2} - 3u_{n+1} + 2u_n = 3^n$, given $u_0 = u_1 = 0$. (07 Marks)

OR

- 6 a. If $f(x) = \begin{cases} 1 & \text{for } |x| \leq a \\ 0 & \text{for } |x| > a \end{cases}$, find the infinite transform of $f(x)$ and hence evaluate $\int_0^{\infty} \frac{\sin x}{x} dx$. (07 Marks)
 b. Obtain the Z-transform of $\cosh n\theta$ and $\sinh n\theta$. (06 Marks)
 c. Find the inverse Z-transform of $\frac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$ (07 Marks)

Module-4

- 7 a. Solve $\frac{dy}{dx} = e^x - y$, $y(0) = 2$ using Taylor's Series method upto 4th degree terms and find the value of $y(1.1)$. (07 Marks)
 b. Use Runge-Kutta method of fourth order to solve $\frac{dy}{dx} + y = 2x$ at $x = 1.1$ given $y(1) = 3$ (Take $h = 0.1$) (06 Marks)
 c. Apply Milne's predictor-corrector formulae to compute $y(0.4)$ given $\frac{dy}{dx} = 2e^x y$, with (07 Marks)

x	0	0.1	0.2	0.3
y	2.4	2.473	3.129	4.059

OR

- 8 a. Given $\frac{dy}{dx} = x + \sin y$; $y(0) = 1$. Compute $y(0.4)$ with $h = 0.2$ using Euler's modified method. (07 Marks)
 b. Apply Runge-Kutta fourth order method, to find $y(0.1)$ with $h = 0.1$ given $\frac{dy}{dx} + y + xy^2 = 0$; $y(0) = 1$. (06 Marks)
 c. Using Adams-Bashforth method, find $y(4.4)$ given $5x \left(\frac{dy}{dx} \right) + y^2 = 2$ with

x	4	4.1	4.2	4.3
y	1	1.0049	1.0097	1.0143

(07 Marks)

Module-5

- 9 a. Solve by Runge Kutta method $\frac{d^2y}{dx^2} = x\left(\frac{dy}{dx}\right)^2 - y^2$ for $x = 0.2$ correct 4 decimal places, using initial conditions $y(0) = 1, y'(0) = 0, h = 0.2$. (07 Marks)
- b. Derive Euler's equation in the standard form, $\frac{\partial f}{\partial y} - \frac{d}{dx} \left[\frac{\partial f}{\partial y'} \right] = 0$. (06 Marks)
- c. Find the extremal of the functional, $\int_{x_1}^{x_2} y^2 + (y')^2 + 2ye^x dx$. (07 Marks)

OR

- 10 a. Apply Milne's predictor corrector method to compute $\frac{d^2y}{dx^2} = 1 + \frac{dy}{dx}$ and the following table of initial values:

x	0	0.1	0.2	0.3
y	1	1.1103	1.2427	1.3990
y'	1	1.2103	1.4427	1.6990

(07 Marks)

- b. Find the extremal for the functional, $\int_0^{\frac{\pi}{2}} [y^2 - y'^2 - 2y \sin x] dx$; $y(0) = 0$; $y\left(\frac{\pi}{2}\right) = 1$. (06 Marks)
- c. Prove that geodesics of a plane surface are straight lines. (07 Marks)

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18CS32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What is data structure? What are the various types of data structure? Explain. (05 Marks)
- b. What is structure? How it is different from array? Explain different types of structure declaration with examples and give differences between Union and Structure. (10 Marks)
- c. Define pointers. How to declare and initialize pointers, explain with example. (05 Marks)

OR

- 2 a. Explain dynamic memory allocation functions in detail. (06 Marks)
- b. Write the Knuth Morris Pratt pattern matching algorithm and apply the same to search the pattern 'abcdabcy' in the text: 'abcxabcdabxabcdabcy' (08 Marks)
- c. Write a C program to:
 - (i) Comparing strings
 - (ii) Concatenate two strings(06 Marks)

Module-2

- 3 a. Define stack. Give the implementation of push, pop and display functions. Include check for empty and full conditions. (07 Marks)
- b. Write the postfix form of the following expressions using stack:
 - (i) $A \$ B * C - D + E | F | (G + H)$
 - (ii) $A - B | (C * D \$ E)$(06 Marks)
- c. Write an algorithm to evaluate a postfix expression and apply the same for the given postfix expression. $ABC - D * + E \$ F +$ and assume $A = 6, B = 3, C = 2, D = 5, E = 1$ and $F = 7$. (07 Marks)

OR

- 4 a. Define recursion. Write a recursive functions for the following:
 - (i) Factorial of a number
 - (ii) Tower of Hanoi(07 Marks)
- b. What is the advantage of circular queue over ordinary queue? Write a C program to simulate the working of circular queue of integers using array. Provide the following operations:
 - (i) Insert
 - (ii) Delete
 - (iii) Display(08 Marks)
- c. Write a note on Dequeue and priority queue. (05 Marks)

Module-3

- 5 a. What is a linked list? Explain the different types of linked lists with neat diagram. (07 Marks)
- b. Write a C function to insert a node at front and delete a node from the rear end in a circular linked list. (08 Marks)
- c. Write a C function for the concatenation of two doubly linked lists. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, $42+8=50$, will be treated as malpractice.

OR

- 6 a. Describe the doubly linked lists with advantages and disadvantages. Write a C function to delete a node from a circular doubly linked list with header node. (08 Marks)
- b. For the given sparse matrix, give the diagrammatic linked representation. (04 Marks)

$$a = \begin{bmatrix} 0 & 1 & 2 \\ 3 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

- c. Write a C function to add two-polynomials represented as circular list with header node. (08 Marks)

Module-4

- 7 a. What is a tree? With suitable example, define:
 (i) Binary tree
 (ii) Level of the binary tree
 (iii) Complete binary tree
 (iv) Degree of the tree (09 Marks)
- b. Write the C routines to traverse the tree using:
 (i) Pre-order traversal (06 Marks)
 (ii) Post-order traversal.
- c. For the given data, draw a binary search tree and show the array and linked representation of the same: 100, 85, 45, 55, 110, 20, 70, 65. (05 Marks)

OR

- 8 a. What is the advantage of the threaded binary tree over binary tree? Explain the construction of threaded binary tree for 10, 20, 30, 40 and 50. (07 Marks)
- b. Define expression tree. For a tree given in Fig.Q8(b) traverse the tree using in-order, preorder and post-order traversals.

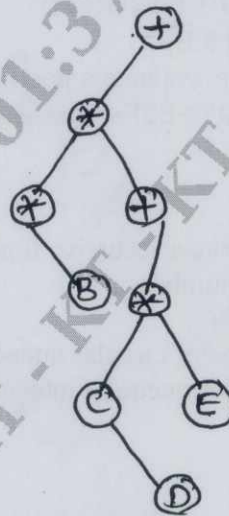


Fig.Q8(b) (07 Marks)

- c. Construct a binary search tree by using the following in-order and preorder traversals:
 Inorder : BCAEDGHEI
 Preorder : ABCDEFGHI (06 Marks)

Module-5

- 9 a. Define graph. For the given graph, show the adjacency matrix and adjacency list representation of the graph [Ref. Fig.Q9(a)]

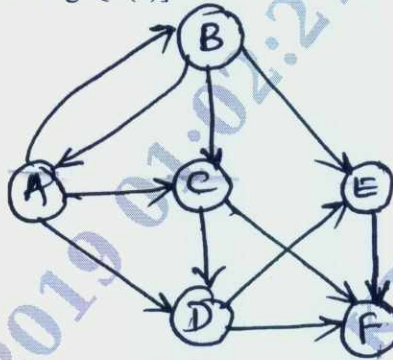


Fig.Q9(a)

- (05 Marks)
- b. What are the methods used for traversing a graph? Explain any one with example and write C function for the same. (08 Marks)
- c. Write a C function for insertion sort. Sort the following list using insertion sort:
50, 30, 10, 70, 40, 20, 60 (07 Marks)

OR

- 10 a. What is collision? What are the methods to resolve collision? Explain linear probing with an example. (07 Marks)
- b. Explain in detail about static and dynamic hashing. (06 Marks)
- c. Briefly explain basic operations that can be performed on a file. Explain indexed sequential file organization. (07 Marks)

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18CS33

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Analog and Digital Electronics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the construction, working and characteristics of photo diode. (06 Marks)
b. With hysteresis characteristics explain the working of Schmitt trigger circuit (Inverting). (06 Marks)
c. With a neat circuit diagram and mathematical analysis explain voltage divider bias circuit. (08 Marks)

OR

- 2 a. Explain the working of R-2R ladder D to A converter. (06 Marks)
b. Explain successive approximation A to D converter. (06 Marks)
c. Show how IC-555 timer can be used as an astable multivibrator. (08 Marks)

Module-2

- 3 a. Find the minimum SOP and minimum POS expressions for the following function using K-map. $f(A, B, C, D) = \sum_m(1, 3, 4, 11) + \sum_d(2, 7, 8, 12, 14, 15)$. (06 Marks)
b. What are the disadvantages of K-map method? How they are overcome in Quine McCluskey method. Simplify following function using Q-M method $f(A, B, C, D) = \sum_m(0, 1, 2, 5, 6, 7, 8, 9, 10, 14)$. (08 Marks)
c. What is Map-Entered Variable method? Using MEV method simplify following function: $f(A, B, C, D) = \sum_m(2, 3, 4, 5, 13, 15) + dc(8, 9, 10, 11)$. (06 Marks)

OR

- 4 a. With the help of flow chart explain how to determine minimum sum of products using Karnaugh map. (06 Marks)
b. Using Q-M method simplify the following function $F(A, B, C, D) = \sum_m(2, 3, 7, 9, 11, 13) + \sum_d(1, 10, 15)$. (08 Marks)
c. With example explain Petrik's method. (06 Marks)

Module-3

- 5 a. What are hazards in digital circuits? Explain different types of hazards. (06 Marks)
b. Implement full subtractor using 3 to 8 decoder and NAND gates. (06 Marks)
c. Differentiate between PAL and PLA. Realize following functions using PLA. Give PLA table and internal connection diagram for the PLA (Use as many common terms as possible)
 $F_1(1, b, c, d) = \sum_m(1, 2, 4, 5, 6, 8, 10, 12, 14)$
 $F_2(a, b, c, d) = \sum_m(2, 4, 6, 8, 10, 11, 12, 14, 15)$ (08 Marks)

OR

- 6 a. What is Multiplexer? Implement following function using 8:1 MUX $f(A, B, C, D) = \sum_m(1, 2, 5, 6, 9, 12)$ (08 Marks)
b. Design Hexadecimal (Binary) to ASCII Code Converter using suitable ROM. Give the connection diagram of ROM. (06 Marks)
c. Explain Simulation and testing of digital circuits. (06 Marks)

Module-4

- 7 a. Explain the structure of VHDL program. Write VHDL code for 4 bit parallel adder using full adder as component. (08 Marks)
- b. Explain the working of SR latch using NOR gates. Show how SR latch can be used for switch debouncing. (07 Marks)
- c. Differentiate between Latch and Flip Flop. Show how SR flipflop can be converted to D flip flop. (05 Marks)

OR

- 8 a. Derive the characteristics equations for D, T, SR and JK flipflops. (08 Marks)
- b. Draw the logic diagram of master slave JK flipflop using NAND gates and explain the working with suitable timing diagram. (07 Marks)
- c. With example explain the syntax of conditional signal assignment statement in VHDL. (05 Marks)

Module-5

- 9 a. What is shift register? Explain the working of 8 bit SISO shift register using SR flip flop. (06 Marks)
- b. With the help of state graph, state and transition tables and timing diagram explain sequential parity checker. (06 Marks)
- c. Design a random counter using T flip flops whose transition graph is shown in Fig.Q.9(c). (08 Marks)

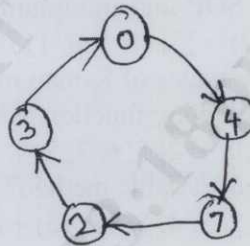


Fig.Q.9(c)

OR

- 10 a. What is register? Explain how 4 bit register with data, load, clear and clock input is constructed using D flip flops. (06 Marks)
- b. With a block diagram explain the working of n-bit parallel adder with accumulator. (06 Marks)
- c. Differentiate between Moore and Melay machines. Analyze following Moore sequential circuit for an input sequence of $X = 01101$ and draw the timing diagram. (08 Marks)

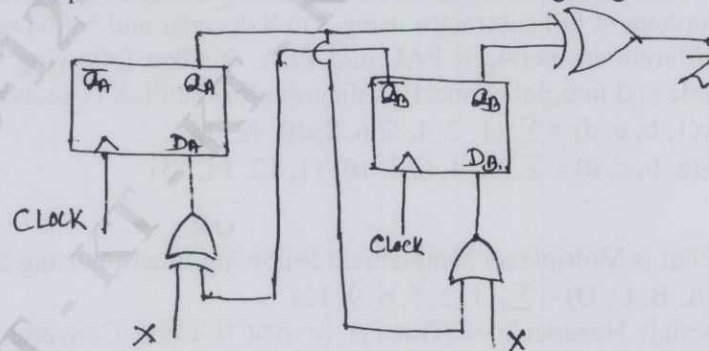


Fig.Q.10(c)

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18CS34

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Computer Organization

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the basic operational concepts of the computer with a neat diagram. (06 Marks)
b. What is performance measurement? Explain the overall SPEC rating for the computer in a program suite. (08 Marks)
c. Explain the following :
(i) Byte addressability (ii) Big-endian assignment (iii) Little-endian assignment. (06 Marks)

OR

- 2 a. Show how the below expression will be executed in one address, two address and three address processors in an accumulator organization.
$$X = A \times B + C \times D$$
 (08 Marks)
b. What is the effective address of the source operand in each of the following instructions, when the Register R1, and R2 of computer contain the decimal value 1200 and 4600?
(i) Load 20(R1), R5 (ii) Move #3000, R5 (iii) Store R5, 30(R1, R2)
(iv) Add - (R2), R5 (v) Subtract (R1)+, R5 (08 Marks)
c. Interpret the Subroutine Stack Frame with example. (04 Marks)

Module-2

- 3 a. Illustrate a program that reads one line from the keyboard, stores it in memory buffer, and echoes it back to the display in an I/O interfaces. (10 Marks)
b. What is an interrupt? What are Interrupt service routines and what are vectored interrupts? Explain with example. (10 Marks)

OR

- 4 a. Demonstrate the DMA and its implementation and show how the data is transferred between memory and I/O devices using DMA controller. (08 Marks)
b. With a neat diagram, explain the general 8-bit parallel interface circuit. (06 Marks)
c. Explain PCI bus data transfer in a computer system. (06 Marks)

Module-3

- 5 a. Explain the organization of $1k \times 1$ memory chip. (08 Marks)
b. With a neat figure explain the direct mapped cache in mapping functions. (08 Marks)
c. What is memory interleaving? Explain. (04 Marks)

OR

- 6 a. With a neat diagram briefly explain the internal organization of $2M \times 8$ dynamic memory chip. (08 Marks)
b. Illustrate cache mapping techniques. (06 Marks)
c. Calculate the average access time experienced by a processor, if a cache hit rate is 0.88, miss penalty is 0.015 milliseconds and cache access time is 10 microseconds. (06 Marks)

Module-4

- 7 a. Perform the addition and subtraction of signed numbers:
(i) +4 and -6 (ii) -5 and -2 (iii) +7 and -3 (iv) +2 and +3
(08 Marks)
b. Explain 4 bit carry - look ahead adder with a neat diagram. (06 Marks)
c. Perform bit pair recoding for (+13) and (-6). (06 Marks)

OR

- 8 a. Perform Booth's algorithm for signed numbers (-13) and (+11). (10 Marks)
b. Show and perform non restoring division for 3 and 8. (10 Marks)

Module-5

- 9 a. Illustrate the sequence of operations required to execute the following instructions
Add (R3), R1 (10 Marks)
b. Explain the three bus organization of a data path with a neat diagram. (10 Marks)

OR

- 10 a. Compare and contrast the following :
(i) Hard - wired control
(ii) Microprogrammed control. (10 Marks)
b. What is pipeline? Explain the 4 stages pipeline with its instruction execution steps and hardware organization. (10 Marks)

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18CS35

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Software Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What is Software Engineering? Explain Software Engineering Code of Ethics. (08 Marks)
- b. What are attributes of good software? Explain the key challenges facing Software Engineering. (08 Marks)
- c. Define (i) Feasibility Study (ii) Functional Requirements (iii) Non Functional Requirements (iv) Domain Requirements. (04 Marks)

OR

- 2 a. With a neat block diagram, explain the Spiral Process Model. (08 Marks)
- b. Explain Requirement Elicitation and Analysis Process. (08 Marks)
- c. What are the fundamental activities of Software Engineering? (04 Marks)

Module-2

- 3 a. Explain following important terms with example:
(i) Identity (ii) Classification (iii) Inheritance (iv) Polymorphism. (10 Marks)
- b. Define the purpose of the following terms with suitable example and UML notation with respect to class model
(i) Multiplicity (ii) Association class (10 Marks)

OR

- 4 a. Explain in brief Class Model, State Model and Interaction model. (10 Marks)
- b. What is Object Oriented Development? Explain different stages of Object Oriented Development. (10 Marks)

Module-3

- 5 a. Explain open source development in detail. (10 Marks)
- b. Explain Model driven engineering in detail and mention Pros and Cons of it. (10 Marks)

OR

- 6 a. With a neat diagram explain context model, with an example. (08 Marks)
- b. Explain the phases of Rational Unified Process Model. (08 Marks)
- c. What is executable UML? Enlist features of executable UML. (04 Marks)

Module-4

- 7 a. With appropriate block diagram, explain the system evolution process. (08 Marks)
- b. Describe the three types of Software maintenance. Why is it sometimes difficult to distinguish between them? (08 Marks)
- c. Mention the advantages of Test Driven Development. (04 Marks)

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OR

- 8 a. Explain the different levels in Development Testing. (08 Marks)
b. Explain the activities involved in Reengineering process with illustrative figures. (08 Marks)
c. Explain the four strategic options of Legacy System Management. (04 Marks)

Module-5

- 9 a. List and explain factors affecting software pricing. (08 Marks)
b. Mention the two approaches used for estimation techniques and explain algorithmic cost modeling. (08 Marks)
c. Bring out the differences between Testing and Inspection. (04 Marks)

OR

- 10 a. Explain plan driven development with a neat block diagram. (10 Marks)
b. Explain three Phases in which Review Process is carried out. (06 Marks)
c. Mention the differences between Product Standards and Process Standard. (04 Marks)

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18CS36

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020

Discrete Mathematical Structures

Time: 3 hrs.

Max. Marks: 100

Note: Answer FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Prove that, for any propositions p, q, r the compound proposition $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$ is a tautology. (06 Marks)
- b. Test the validity of the following argument.
 If I study, I will not fail in the examination.
 If I do not watch TV in the evenings, I will study.
 I failed in the examination.

 \therefore I must have watched TV in the evenings (07 Marks)

- c. Let $p(x) : x^2 - 7x + 10 = 0$, $q(x) : x^2 - 2x + 3 = 0$, $r(x) : x < 0$. Find the truth or falsity of the following statements, when the universe U contains only the integers 2 and 5,
- (i) $\forall x, p(x) \rightarrow \sim r(x)$ (ii) $\forall x, q(x) \rightarrow r(x)$
 (iii) $\exists x, q(x) \rightarrow r(x)$ (iv) $\exists x, p(x) \rightarrow r(x)$ (07 Marks)

OR

- 2 a. Prove that, for any three propositions p, q, r
 $[(p \vee q) \rightarrow r] \Leftrightarrow [(p \rightarrow r) \wedge (q \rightarrow r)]$ (06 Marks)
- b. Prove that, the following are valid arguments:
 (i) $p \rightarrow (q \rightarrow r)$ (ii) $\sim p \leftrightarrow q$
 $\sim q \rightarrow \sim p$ $q \rightarrow r$
 \underline{p} $\underline{\sim r}$
 $\therefore r$ $\therefore p$ (07 Marks)

- c. Give :
 (i) a direct proof
 (ii) an indirect proof.
 (iii) proof by contradiction for the following statement.
 "If n is an odd integer, then $n+9$ is an even integer". (07 Marks)

Module-2

- 3 a. Prove that for each $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{1}{6}n(n+1)(2n+1)$. (06 Marks)
- b. Determine the coefficient of,
 (i) xyz^2 in the expansion of $(2x - y - z)^4$.
 (ii) $x^2y^2z^3$ in the expansion of $(3x - 2y - 4z)^7$. (07 Marks)
- c. A woman has 11 close relatives and she wishes to invite 5 of them to dinner. In how many ways can she invite them in the following situations:
 (i) There is no restriction on the choice.
 (ii) Two particular persons will not attend separately.
 (iii) Two particular persons will not attend together. (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 4 a. Prove that every positive integer $n \geq 24$ can be written as a sum of 5's and / or 7's. (06 Marks)
- b. Find the number of permutations of the letters of the word MASSASAUGA. In how many of these all four A's are together? How many of them begin with S? (07 Marks)
- c. In how many ways can one distribute eight identical balls into four distinct containers, so that, (i) No containers is left empty. (07 Marks)
(ii) The fourth container gets an odd number of balls.

Module-3

- 5 a. For any non empty sets A, B, C prove that,
(i) $A \times (B \cup C) = (A \times B) \cup (A \times C)$
(ii) $(A \times (B - C)) = (A \times B) - (A \times C)$ (06 Marks)
- b. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = \begin{cases} 3x - 5 & \text{for } x > 0 \\ -3x + 1 & \text{for } x \leq 0 \end{cases}$.
- (i) Determine $f(0)$, $f\left(\frac{5}{3}\right)$ (ii) Find $f^{-1}([-5, 5])$. (07 Marks)
- c. Let f, g, h be functions from \mathbb{Z} to \mathbb{Z} defined by $f(x) = x - 1$, $g(x) = 3x$,
 $h(x) = \begin{cases} 0 & \text{if } x \text{ is even} \\ 1 & \text{if } x \text{ is odd} \end{cases}$. Verify that $(f \circ g) \circ h(x) = f \circ (g \circ h)(x)$. (07 Marks)

OR

- 6 a. Let $A = \{1, 2, 3, 4, 6\}$ and R be a relation on A defined by aRb if and only if "a is a multiple of b". Represent the relation R as a matrix and draw its diagram. (06 Marks)
- b. Draw the Hasse diagram representing the positive divisors of 36. (07 Marks)
- c. Let $A = \{1, 2, 3, 4, 5\}$, define a relation R on $A \times A$, by $(x_1, y_1)R(x_2, y_2)$ if and only if $x_1 + y_1 = x_2 + y_2$
(i) Verify that R is an equivalence relation. (07 Marks)
(ii) Find the partition of $A \times A$ induced by R.

Module-4

- 7 a. There are eight letters to eight different people to be placed in eight different addressed envelopes. Find the number of ways of doing this so that at least one letter gets to the right person. (06 Marks)
- b. In how many ways can the 26 letters of the English alphabet be permuted so that none of the patterns CAR, DOG, PUN or BYTE occurs? (07 Marks)
- c. By using the expansion formula, obtain the rook polynomial for the board C. (07 Marks)

		1
	2	3
4	5	6
7	8	

OR

- 8 a. An apple, a banana, a mango and an orange are to be distributed to four boys B_1, B_2, B_3, B_4 . The boys B_1 and B_2 do not wish to have apple. The boy B_3 does not want banana or mango, and B_4 refuses orange. In how many ways the distribution can be made so that no boy is displeased? (06 Marks)
- b. If $a_0 = 0$, $a_1 = 1$, $a_2 = 4$ and $a_4 = 37$ satisfy the recurrence relation $a_{n+2} + ba_{n+1} + ca_n = 0$, for $n \geq 0$, find the constants b and c, and solve the relation a_n . (07 Marks)
- c. How many integers between 1 and 300 (inclusive) are,
(i) Divisible by at least one of 5, 6, 8?
(ii) Divisible by none of 5, 6, 8? (07 Marks)

Module-5

- 9 a. Show that the following two graphs shown in Fig. Q9 (a) – (i) and Fig. Q9 (a) – (ii) are isomorphic, (06 Marks)

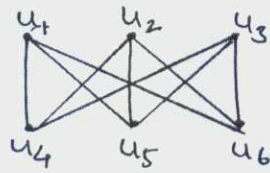


Fig. Q9 (a) – (i)

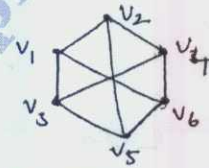


Fig. Q9 (a) – (ii)

- b. Define the following with example of each, (07 Marks)
- Simple graph
 - Sub graph
 - Compliment of a graph
 - Spanning sub graph
- c. Construct an optimal prefix code for the symbols a, o, q, u, y, z that occurs with frequencies 20, 28, 4, 17, 12, 7 respectively. (07 Marks)
- OR**
- 10 a. Prove that two simple graphs G_1 and G_2 are isomorphic if and only if their complements are isomorphic. (06 Marks)
- b. Let $G = (V, E)$ be a simple graph of order $|V| = n$ and size $|E| = m$, if G is a bipartite graph. Prove that $4m \leq n^2$. (07 Marks)
- c. Construct an optimal prefix code for the letters of the word ENGINEERING. Hence deduce the code for this word. (07 Marks)

CBCS SCHEME

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18MATDIP31

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020

Additional Mathematics – I

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Express the following complex number in the form of $x + iy$: $\frac{(1+i)(1+3i)}{1+5i}$. (06 Marks)
- b. Prove that $\left(\frac{\cos\theta + i\sin\theta}{\sin\theta + i\cos\theta}\right)^4 = \cos 8\theta + i\sin 8\theta$. (07 Marks)
- c. If $\vec{a} = (3, -1, 4)$, $\vec{b} = (1, 2, 3)$ and $\vec{c} = (4, 2, -1)$, find $\vec{a} \times (\vec{b} \times \vec{c})$. (07 Marks)

OR

- 2 a. Find the angle between the vectors, $\vec{a} = 5\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} - 3\hat{j} + 6\hat{k}$. (06 Marks)
- b. Prove that $\left[\vec{a} \times \vec{b}, \vec{b} \times \vec{c}, \vec{c} \times \vec{a}\right] = \left[\vec{a}, \vec{b}, \vec{c}\right]^2$ (07 Marks)
- c. Find the fourth roots of $-1 + i\sqrt{3}$ and represent them on the argand diagram. (07 Marks)

Module-2

- 3 a. Obtain the Maclaurin's expansion of $\log_e(1+x)$. (06 Marks)
- b. If $u = \sin^{-1}\left[\frac{x^3 + y^3}{x + y}\right]$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 2 \tan u$. (07 Marks)
- c. If $u = x(1-y)$, $v = xy$, find $\frac{\partial(u,v)}{\partial(x,y)}$. (07 Marks)

OR

- 4 a. Obtain the Maclaurin's series expansion of the function $\log_e \sec x$. (06 Marks)
- b. If $u = x^2 - 2y$; $v = x + y$ find $\frac{\partial(u,v)}{\partial(x,y)}$. (07 Marks)
- c. If $u = f(x-y, y-z, z-x)$, prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$. (07 Marks)

Module-3

- 5 a. Find the velocity and acceleration of a particle moves along the curve, $\vec{r} = e^{-2t}\hat{i} + 2\cos 5t\hat{j} + 5\sin 2t\hat{k}$ at any time t . (06 Marks)
- b. Find $\text{div } \vec{F}$ and $\text{curl } \vec{F}$, where $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$. (07 Marks)
- c. Show that $\vec{F} = (2xy + z^2)\hat{i} + (x^2 + 2yz)\hat{j} + (y^2 + 2xz)\hat{k}$ is conservative force field and find the scalar potential. (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Show that the vector field, $\vec{F} = (3x + 3y + 4z)\hat{i} + (x - 2y + 3z)\hat{j} + (3x + 2y - z)\hat{k}$ is solenoidal. (06 Marks)
- b. Find the directional derivative of $\phi = \frac{xz}{x^2 + y^2}$ at $(1, -1, 1)$ in the direction of $\vec{A} = \hat{i} - 2\hat{j} + \hat{k}$. (07 Marks)
- c. Find the constant 'a' such that the vector field $\vec{F} = 2xy^2z^2\hat{i} + 2x^2yz^2\hat{j} + ax^2y^2z\hat{k}$ is irrotational. (07 Marks)

Module-4

- 7 a. Find the reduction formula for $\int_0^{\frac{\pi}{2}} \sin^n x dx$. (06 Marks)
- b. Evaluate $\int_0^1 \int_0^3 x^3 y^3 dx dy$. (07 Marks)
- c. Evaluate $\int_0^3 \int_0^2 \int_0^1 (x + y + z) dz dx dy$. (07 Marks)

OR

- 8 a. Evaluate: $\int_0^{\frac{\pi}{6}} \sin^6(3x) dx$. (06 Marks)
- b. Evaluate: $\int_0^1 \int_x^{\sqrt{x}} xy dy dx$. (07 Marks)
- c. Evaluate: $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} xyz dz dy dx$. (07 Marks)

Module-5

- 9 a. Solve: $\frac{dy}{dx} + y \cot x = \sin x$. (06 Marks)
- b. Solve: $(2x^3 - xy^2 - 2y + 3)dx - (x^2y + 2x)dy = 0$. (07 Marks)
- c. Solve: $3x(x + y^2)dy + (x^3 - 3xy - 2y^3)dx = 0$. (07 Marks)

OR

- 10 a. Solve: $(5x^4 + 3x^2y^2 - 2xy^3)dx + (2x^3y - 3x^2y^2 - 5y^4)dy = 0$. (06 Marks)
- b. Solve: $\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$. (07 Marks)
- c. Solve: $[1 + (x + y) \tan y] \frac{dy}{dx} + 1 = 0$. (07 Marks)

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Question Paper Version : B

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Constitution of India and Professional Ethics and Cyber Law

(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the Hundred questions, each question carries **ONE mark**.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

-
1. Salaries and other emoluments of the High Court Judges shall be determined by the
a) Governor b) Parliament c) Chief Minister d) State Legislature
 2. According to 74th Amendment Act of 1993, which subject has been incorporated?
a) Municipalities b) Co-operative Society
c) Gram Panchayat d) Taluk Panchayat
 3. IP Sec is designed to withstand replay attacks through the use of
a) Sequence numbers b) Nonces
c) Nonces + Sequence numbers d) Timestamps
 4. The Key Confirmation Key [KCK] is used to
a) Integrity – protect data between the station and the AP
b) Integrity – protect messages in the four – way hand shake
c) Encrypt data between the station and the AP
d) Encrypt the message containing the group key.
 5. Which of the following is true in a Smurf Attack?
a) The Victim receives large number of UDP packers to non – listening ports
b) The Victim receives large number of TCP SYN – ACK packers
c) The Victim receives large number of ICMP “Echo Request” messages
d) The Victim receives large number of ICMP “Echo Reply” messages.

6. A persistent cross – site scripting attack saves malicious code on
 - a) The client
 - b) The server
 - c) Both client & server
 - d) Neither (a) & (b)
7. The possible goal of an attacker is sending packets with invalid combinations of TCP header flag is to
 - a) Launch a SYN flood attack
 - b) Find which services are open
 - c) Perform OS finger printing
 - d) Determine the addressing schema within an organisation
8. The SOAP binding refers to
 - a) The object bound to a SOAP message
 - b) The XML schema of a SOAP message
 - c) The mapping between a SOAP message underlying transport protocol
 - d) The headers in a SOAP message
9. The EKE protocol is resistant to
 - a) Replay attacks
 - b) Man – in – the middle attacks
 - c) Dictionary attacks
 - d) Reflection attacks
10. The SIM authenticates itself to the MSC/HLR using
 - a) A user password
 - b) A digital certificate
 - c) A response to a challenge
 - d) An encrypted signaling message.
11. To become a Judge of High Court, one must be practicing Advocate of High Court for a period of atleast _____ years
 - a) 20
 - b) 10
 - c) 15
 - d) 5
12. The Constitution empowers State Government to make Special Law for
 - a) Workers
 - b) Teachers
 - c) Women & Children
 - d) Farmers
13. Directive principles come under _____ of the Constitution
 - a) Part - II
 - b) Part - III
 - c) Part - IV
 - d) Part – I
14. The system of Legislature in the State of Karnataka is
 - a) Bicameral
 - b) Unicameral
 - c) Cameral
 - d) Multi cameral
15. The Mandal Commission, was Constituted relating to
 - a) Reservation of SCs
 - b) Reservation to STs
 - c) Reservation
 - d) Reservation to Backward classes
16. Who is appointing Chief Election Commissioner?
 - a) Prime Minister
 - b) Law Minister
 - c) President
 - d) Vice - President
17. Who is the Ex – Officio Chairman of Rajya Sabha?
 - a) President
 - b) Vice - President
 - c) Prime Minister
 - d) Governor
18. Vice – President of India is elected
 - a) By the people
 - b) By the members of State Legislature Assembly
 - c) By the members of Rajya Sabha
 - d) By the members of both the houses of Parliament at a joint sitting.

19. Which Amendment deals with the establishment of Municipalities a part of Constitution system?
a) 44th b) 74th c) 76th d) 86th
20. Who appoints the Governor of the State?
a) Chief Justice of India b) Chief Justice of State
c) Chief Minister d) President
21. Uniform Civil code means
a) A code related to individuals public life b) A code meant for Hindu only
c) A Civil procedure code
d) A Codified Law applicable to all person of India irrespective of their religion
22. The Vice – President has power
a) To sign bills passed by Rajya Sabha b) To preside over Rajya Sabha
c) To nominate two members for Rajya Sabha d) To propagate ordinance
23. Parliament of India consists of
a) Lok Sabha b) Lok Sabha & Rajya Sabha
c) Only Rajya Sabha d) None of these
24. A National emergency can remain in operation with the approval of Parliament for
a) An indefinite period b) A maximum period of 6 months
c) A maximum period of 1 year d) A maximum period of 3 years
25. In Engineering research and testing, retaining the contradictory statement, discarding the rest is called
a) Trimming b) Scanning c) Cooking d) Skimming
26. The Chief Justice and other Judges of High Court are appointed by
a) President b) Chief Minister c) Prime Minister d) Governor
27. The terms 'Ethics' is derived from
a) Ethical in English b) Ethic in Latin c) Custom d) Ethicos in Greek
28. The aim of the Directive Principles of State Policy is to establish
a) Capitalist State in Our Country b) Communist State in Our Country
c) Welfare State in the Country d) All of these
29. Special majority means more than
a) 50% majority b) Two – third majority c) 75% majority d) 60 - majority
30. One way of misusing the truth is
a) Exaggerating the truth b) Making wrong statement
c) Making confused statement d) Failure to seek out the truth
31. India has
a) Democracy b) Presidential system
c) Direct Democracy d) Parliamentary Democracy

32. What is the punishment given , if computer source documents are tampered
a) Imprisonment of 2 years with fine of Rs 2 lakhs
b) Imprisonment of 3 years with fine of Rs 2 lakhs
c) Imprisonment of 4 years with fine of Rs 2 lakhs
d) Imprisonment of 5 years with fine of Rs 2 lakhs
33. What is the punishment given , if computer has been hacked under Section 43
a) Imprisonment of 1 year with fine upto Rs 2 lakhs
b) Imprisonment of 3 years with fine upto Rs 5 lakhs
c) Imprisonment of 3 years with fine upto Rs 4 lakhs
d) Imprisonment of 4 years with fine upto Rs 5 lakhs
34. Who appoints Prime Minister
a) The President of India
b) Lok Sabha
c) The majority party is Lok Sabha
d) Rajya Sabha
35. How much time was taken for framing Constitution?
a) 2 years 11 months and 18 days
b) 13 years 11 months and 18 days
c) 4 years 11 months and 18 days
d) 1 year 11 months and 18 days
36. The President of India is
a) The real ruler of India
b) Head of the Government
c) Constitution Head of Country
d) Head of the State
37. Which of the State has highest members in Lok Sabha
a) Andra Pradesh b) Uttar Pradesh c) Madhya Pradesh d) Karnataka
38. The Council of Ministers and Prime Minister shall not exceed total strength of the Lok Sabha
a) 5 % b) 10 % c) 12 % d) 15 %
39. The total number of seats in Legislative Assembly of Karnataka is
a) 200 b) 224 c) 240 d) 250
40. The basic feature of the Indian Constitution is found in
a) Fundamental duties b) Fundamental Rights
c) Preamble d) Directive Principle of State Policy
41. The Chief Justice of High – Court is appointed by
a) President b) Chief Minister c) Prime Minister d) Governor
42. Which is Not a Fundamental right
a) Right to freedom b) Right to Constitutional remedy
c) Right to property d) Right to equality
43. The tenure of Vice – President
a) 2 years b) 5 years c) 3 years d) 1 year
44. How many Schedules are there in Indian Constitution?
a) 7 b) 5 c) 12 d) 6

45. The membership of Legislative Assembly of State varies between
 a) 60 & 500 b) 100 & 300 c) 150 & 450 d) 100 & 400
46. According to Indian Constitution, the power of amending the Constitution is vested with
 a) Parliament b) President
 c) People d) The Prime Minister of India
47. Engineers can use code of ethics as guidelines to
 a) Resolve the conflicts b) Formulate the problem
 c) Shift of Responsibility d) Overcome the work pressure
48. What is the maximum strength of Lok Sabha
 a) 500 b) 545 c) 552 d) 550
49. Union list has
 a) 95 subjects b) 97 subjects c) 105 subjects d) 66 subjects
50. The Fundamental Rights of Indian citizen are contained in
 a) Part – III of Constitution b) Part – IV of Constitution
 c) The 7th Schedule of Constitution d) None of these
51. Who appoints Lieutenant Governor General to Delhi
 a) PM b) Law Minister c) President d) Vice - President
52. Who acts as a President when neither the President nor the Vice – President is available
 a) Speaker of Lok Sabha b) Attorney General of India
 c) Chief Justice of India d) Speaker of Rajya Sabha
53. How many judges are there in the SC including Chief Justice of India?
 a) 15 b) 19 c) 25 d) 31
54. The Parliamentary system of the Indian Constitution is borrowed from
 a) Britain Constitution b) Objective Constitution
 c) Canada Constitution d) Australian Constitution
55. The final interpreter to the Indian Constitution is
 a) Speaker of LS b) Parliament c) President d) Supreme Court
56. The person arrested has to be produced before Magistrate within
 a) 1 week b) 24 hours c) 72 hours d) 2 months
57. Which is the language to be used in Parliament
 a) Kannada b) Hindi c) English d) Both (b) & (c)
58. President made Proclamation of emergency on the grounds of internal disturbance for first time in
 a) 1975 b) 1965 c) 1962 d) 1950
59. Who will impeach Chief Election Commissioner of India
 a) President b) Vice President
 c) Prime Minister d) By 2/3rd majority of Parliament

60. Which is the highest Court of the Country
a) High Court b) Supreme Court c) District Court d) CET
61. One of the salient features of our constitution in
a) It is fully rigid b) It is fully flexible
c) It is partly rigid and partly flexible d) None of these
62. A person to be appointed as a Governor of a State must have completed the age of
a) 30 years b) 35 years c) 45 years d) 50 years
63. The Chief Election Commission holds office for a period of
a) 3 years b) 6 years
c) 5 years d) 6 years or till he attains age of 65 years
64. The procedure for amending the constitution is detailed under
a) Article 360 b) Article 368 c) Article 352 d) Article 301
65. Writ of Mandamus can be issued on the ground of
a) Non – performance of public duties b) Unlawful Detention
c) Unlawful occupation of public office d) None of these
66. Who acted as the Chairman of the drafting committee of the Constitution of India?
a) Dr. B.R. Ambedkar b) B.C. Rajgopalanchari
c) Dr. Rajendra Prasad d) Jawaharlal Nehru
67. Engineering Ethics is
a) A macro Ethics b) Business Ethics
c) A developing Ethics d) A code of Scientific rules based on Ethics
68. The use of intellectual property of others without permission or credit is referred as
a) Cooking b) Stealing c) Plagiarism d) Trimming.
69. Who is the chair person of Parliament
a) CM b) PM c) FM d) Speaker
70. Who will impeach the Chief Justice of India
a) Supreme Court b) Law Minister
c) 2/3rd Majority of Parliament d) By Rajya Sabha
71. When the office of the President falls vacant , the same must be filled up within
a) 4 months b) 6 months c) 12 months d) 18 months
72. The Preamble of the Constitution indicates
a) Power to make laws
b) The sovereign of Indian Constitution
c) Power of Parliament to amend the Constitution
d) Sources of Constitution.
73. Which important human right is protected under Article 21
a) Right to Equality b) Right to life and liberty
c) Right to freedom of speech d) Right to religion

74. Right to Equality is guaranteed under Article
 a) 13 b) 15 c) 16 d) 14
75. No person shall be punished for same offence more than once
 a) Jeopardy b) Double Jeopardy
 c) Ex-post facto law d) Testimonial compulsion
76. The Rajya Sabha
 a) Is a Permanent House b) Has a life of 6 years
 c) Has a life of 5 years d) Has a life of 7 years
77. The Quorum or minimum number of members required to hold the meetings of either houses of the Parliament is
 a) One - tenth b) One - fifth c) One - third d) One - fourth
78. The Advice of Supreme Court is
 a) Binding on the President
 b) Not binding on the President
 c) Binding on the President if it is tendered unanimously
 d) None of these
79. Article 19 provides
 a) 6 freedoms b) 7 freedoms c) 8 freedoms d) 5 freedoms
80. Who is the present speaker of Lok Sabha
 a) Sumithra Mahajan b) K.S Hegde c) Om Birla d) Venkiah Naidu
81. Which is the landmark Judgement passed by the Supreme Court in respect to Preamble of Constitution
 a) Beur beri b) Keshavananda Bharathi
 c) Menaka Gandhi d) Sonia Gandhi
82. Who is the neutral person in the affairs of party politics
 a) C.M b) Home Minister c) Finance Minister d) Speaker
83. Indian Constitution guarantees reservation of seats to SC & ST in
 a) Lok Sabha and Assembly b) Lok Sabha only
 c) Lok Sabha and Rajya Sabha d) Rajya Sabha
84. Who will preside over the joint session of both the houses of the Parliament
 a) President b) Prime Minister c) Speaker d) Law Minister
85. What is the minimum age for becoming M.P in Rajya Sabha and Lok Sabha
 a) 18 and 25 b) 25 and 18 c) 25 and 30 d) 30 and 25
86. India is referred to as _____ under the Indian Constitution
 a) Country b) Hindustan c) India d) Bharat
87. The citizens can enforce their Fundamental Rights before SC under
 a) Article 31 b) Article 32 c) Article 33 d) Article 34

88. Who quoted "Child of Today is Citizen of Tomorrow"?
- a) L. Tilak b) Jawaharlal Nehru c) B.R. Ambedkar d) Gandhiji
89. What is the minimum age required for casting of Vote
- a) 18 b) 19 c) 20 d) 21
90. Who quoted "Freedom is my birth right"?
- a) L. Tilak b) Jawaharlal Nehru c) Sardar Patel d) Gandhiji
91. When the Indian Constitution enacted and adopted?
- a) 26/10/1949 b) 26/12/1949 c) 26/11/1949 d) 26/01/1949
92. When the Indian Constitution gives effect
- a) 26/10/1949 b) 26/12/1949 c) 26/01/1950 d) 26/01/1949
93. Which of the following word was added in the Preamble of the Constitution by 42nd Amendment Act 1976
- a) Socialist b) Sovereign c) Federal d) Republic
94. The President power to suspend death sentence temporarily is called
- a) Respite b) Reprieve c) Remission d) Constitution
95. The Preamble of the Constitution has been amended so far
- a) 4 times b) 3 times c) twice d) Once
96. Who are not entitled to form Union
- a) Students b) Police c) Teachers d) Entrepreneurs
97. Which is not a Fundamental Right
- a) Right against exploitation b) Right to freedom of religion
c) Right to strike d) Right to equality
98. Which of the following is not one of the 3 organs of state / Union
- a) Executive b) Press c) Judiciary d) Legislation
99. How many Anglo Indians and others can be nominated by the President to the Lok Sabha and Rajyasabha
- a) 2 & 12 b) 2 & 10 c) 1 & 12 d) 1 & 10
100. Which state Constitution has removed by the Parliament of India?
- a) West Bengal b) Nagaland c) Sikkim d) Jammu & Kashmir
