CBCS SCHEME

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21MAT31

Third Semester B.E. Degree Examination, June/July 2023
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

$$2^t + \frac{\cos 2t + \cos 3t}{t}$$ **(06 Marks)**

b. Find the Laplace transform of the triangular wave of period 2C given by

$$f(t) = \begin{cases} t & 0 < t < c \\ 2c - t & c < t < 2c \end{cases}$$ **(07 Marks)**

c. Using convolution theorem find the inverse Laplace transform of

$$\frac{s}{(s^2 + a^2)^2}$$ **(07 Marks)**

OR

2 a. Express the function f(t) in terms of unit step function and hence find the Laplace transform of

$$f(t) = \begin{cases} \sin t & 0 < t < \pi \\ \sin 2t & \pi < t < 2\pi \\ \sin 3t & t \geq 2\pi \end{cases}$$ **(06 Marks)**

b. Find the inverse laplace transform $\frac{2s^2 - 6s + 5}{(s-1)(s-2)(s-3)}$ **(07 Marks)**

c. Solve the using Laplace transform method

$y''(t) + 4y'(t) + 4y = e^{-t}$ $y(0) = 0$ $y'(0) = 0$ **(07 Marks)**

Module-2

3 a. Obtain the Fourier series of $f(x) = \frac{\pi - x}{2}$ in $0 < x < 2\pi$. Hence deduce that

$$1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \ldots\ldots = \frac{\pi}{4}$$ **(06 Marks)**

b. Obtain the half range cosine series for the function $f(x) = 2x - 1$ in $0 < x < 1$ **(07 Marks)**

c. Obtain the Fourier series of y upto the first harmonic for the following values:

x°	45	90	135	180	225	270	315	360
y	4.0	3.8	2.4	2.0	-1.5	0	2.6	3.4

(07 Marks)

OR

4 a. Obtain the Fourier series of $f(x) = x\cos x$ in the interval $-\pi \le x \le \pi$. **(06 Marks)**

b. Obtain the sine half range Fourier series for the function,

$$f(x) = \begin{cases} \frac{2Kx}{\ell} & \text{in } 0 \le x \le \frac{\ell}{2} \\ \frac{2K}{\ell}(\ell - x) & \text{in } \frac{\ell}{2} \le x \le \ell \end{cases}.$$ **(07 Marks)**

c. Obtain the constant term and the first three coefficients in the Fourier cosine series of y in the following data :

x	0	1	2	3	4	5
y	4	8	15	7	6	2

(07 Marks)

Module-3

5 a. Find the complex Fourier transform of the function,

$$f(x) = \begin{cases} a^2 - x^2 & \text{for } |x| < a \\ 0 & \text{for } |x| > a \end{cases}.$$

Hence evaluate $\int_0^\infty \left(\frac{\sin s - s\cos s}{s^3}\right) ds = \frac{\pi}{2}$. **(06 Marks)**

b. Find the Fourier sine transform of e^{-ax}. **(07 Marks)**

c. Find the z-transform of $\cos n\theta$ and $\sin n\theta$. **(07 Marks)**

OR

6 a. Find the Fourier cosine transform of the function, $f(x) = \begin{cases} 4x & 0 < x < 1 \\ 4 - x & 1 < x < 4 \\ 0 & x > 4 \end{cases}$. **(06 Marks)**

b. Find the inverse z-transform of $\frac{2z^2 + 3z}{(z+2)(z-4)}$. **(07 Marks)**

c. Solve by using z-transform $y_{n+2} - 4y_n = 0$ given that $y_0 = 0$ and $y_1 = 2$. **(07 Marks)**

Module-4

7 a. Classify the following partial differential equation

i) $\frac{\partial^2 u}{\partial x^2} + 4\frac{\partial^2 u}{\partial x \partial y} + 4\frac{\partial^2 u}{\partial y^2} - \frac{\partial y}{\partial x} + 2\frac{\partial u}{\partial y} = 0$

ii) $x^2 \frac{\partial^2 u}{\partial x^2} + (1 - y^2)\frac{\partial^2 u}{\partial y^2} = 0 \quad -\infty < x < \infty, -1 < y < 1$

iii) $(1 + x^2)\frac{\partial^2 u}{\partial x^2} + (5 + 2x^2)\frac{\partial^2 u}{\partial x \partial t} + (4 + x^2)\frac{\partial^2 u}{\partial t^2} = 0$

iv) $(x + 1)\frac{\partial^2 u}{\partial x^2} - 2(x + 2)\frac{\partial^2 u}{\partial x \partial y} + (x + 3)\frac{\partial^2 u}{\partial y^2} = 0$ **(10 Marks)**

b. Find the values of u(x, t) satisfying the parabolic equation $\frac{\partial^2 u}{\partial x^2} = 2\frac{\partial u}{\partial t}$ and its boundary conditions u(0, t) = 0 = u (4,t) and u(x, 0) = x(4 – x) by taking h = 1 find the value up to t = 5. **(10 Marks)**

OR

8 a. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in $0 < x < 5, t \geq 0$ given that u(x, 0) = 20 u(0, t) = 0 u(5,t) = 100 compute U for the time step h = 1 by crank Nicholson method. **(10 Marks)**

b. Solve the wave equation $\frac{\partial^2 u}{\partial t^2} = 4\frac{\partial^2 u}{\partial x^2}$ subject to the condition u(0, t) = 0 u(4, t) = 0 $u_t(x, 0) = 0$ and u(x, 0) = x(4 – x) by taking h = 1, K = 0.5 up to four steps. **(10 Marks)**

Module-5

9 a. Given $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} - 2xy = 1$, y(0)) = 1, y'(0) = 0 evaluate y(0.1) using Runge-Kutta method of order 4. **(06 Marks)**

b. Derive the Euler's equation of the form $\frac{\partial t}{\partial y} - \frac{d}{dx}\left(\frac{\partial t}{\partial y1}\right) = 0$. **(07 Marks)**

c. Find the extremal of the functional $I = \int_0^{\pi/2} (y^2 - y'^2 - 2y\sin x)dx$ under the conditions y(0) = y(π/2) = 0. **(07 Marks)**

OR

10 a. Apply Milne's predictor corrector method to solve $\frac{d^2y}{d^2x} = 1 - 2y\frac{dy}{dx}$ at 0.8 given that
y(0) = 0, y(0.2) = 0.02, y(0.4) = 0.0795, y(0.6) = 0.1762,
y'(0) = 0, y'(0.2) = 0.1996, y'(0.4) = 0.3937, y'(0.6) = 0.5689. **(06 Marks)**

b. Show that the geodesics on a plane are straight line. **(07 Marks)**

c. Which curve the functional $\int_0^{\pi/2} (y'^2 - y^2 + 2xy)dx$, y(0) = 0, y(π/2) = 0 be extremized. **(07 Marks)**

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21CS32

Third Semester B.E. Degree Examination, June/July 2023
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. Define data structures. Classify data structures in various features. **(06 Marks)**

b. Write algorithms to insert a data element into array and delete an element from the array. **(07 Marks)**

c. Explain various memory allocation and de-allocation function supported in C. **(07 Marks)**

OR

2 a. Explain user defined structures with respect to C. Give structure definition and declaration for STUDENT data with the following information: USN and Name. Also give self referential structure. **(04 Marks)**

b. Show array representation of two polynomials. Write a C function to add two polynomials A(x) and B(x) term by term to produce D(x) where D(x) = A(x) + B(x), $A(x) = 2x^{10} + x + 3$, $B(x) = x^5 + 10x^3 + 3x^2 + 12$. **(08 Marks)**

c. Obtain triplet representation for the given sparse matrix. Write fast transpose algorithm to obtain transpose of sparse matrix. **(08 Marks)**

$$\begin{bmatrix} 15 & 0 & 0 & 22 & 0 & -15 \\ 0 & 11 & 3 & 0 & 0 & 0 \\ 0 & 0 & 0 & -6 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 91 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 28 & 0 & 0 & 0 \end{bmatrix}$$

Module-2

3 a. How recursion uses stack during its execution. Give algorithm to simulate Tower of Henoi. Trace the algorithm for a total of 3 disc which are placed in source pole. **(06 Marks)**

b. Write C routines to implement operations on stack. Also incorporate useful routines to check the stack status for full and empty. Also include global declarations. **(07 Marks)**

c. Write algorithm to convert infix expression to prefix form. Apply the algorithm to obtain equivalent prefix form. Infix expression : $6 * 2 \wedge 2 \wedge 3/(9 - 3)$ **(07 Marks)**

OR

4 a. Design circular queue using dynamically allocated arrays. Give steps to relocate elements in dynamic array for proper insertion and deletion. **(04 Marks)**

b. With the help of algorithm, evaluate the postfix expression 6223$\wedge\wedge$*3/ using stack. **(08 Marks)**

c. What is the advantage circular queue over ordinary queue? Give ADT to perform various operations on circular queue. Also give ADTs to check for empty and full. **(08 Marks)**

Module-3

5 a. Give structure representation in C to create a single linked list. Give C routine to implement following operations on SLL:
(i) Create SLL of integer data
(ii) Insert a node at rear end
(iii) Delete a node from front end
(iv) Display all nodes neatly
(v) Search for a suitable data in SLL and display appropriate message. **(12 Marks)**

b. What is the advantage of doubly linked list? Give suitable steps to insert a node between A and B (consider A is NULL, B is NULL and A & B are not NULL) in SLL. **(08 Marks)**

OR

6 a. Write the node representation of the linked representation of a polynomial. Also give algorithm to perform addition on two polynomials. **(10 Marks)**

b. Differentiate between SLL, DLL, circular linked list and header linked list. Give algorithm to insert anode circular linked list and traverse the list. **(10 Marks)**

Module-4

7 a. Define tree. For the given tree, explain terminologies and write the answer:
(i) Degree (ii) Non terminal (iii) Sibling
(iv) Ancestor (v) Level (vi) Height

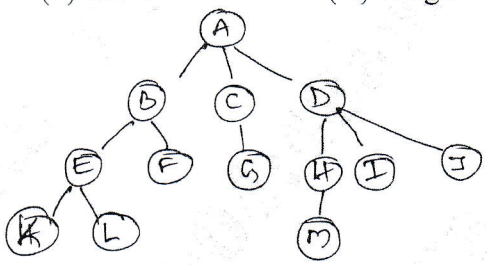

Fig.Q7(a) **(06 Marks)**

b. Give C routine to create BST for the data 12, 0, –90, 5, 3, 10, 0, 8, 18. Give 3 traversals of BST constructed from above data. **(07 Marks)**

c. Given in order sequence DJHBEAFICG and post order sequence JHDEBIFGCA, construct binary tree and give pre-order traversal. **(07 Marks)**

OR

8 a. Give array and linked list representation for the binary tree.

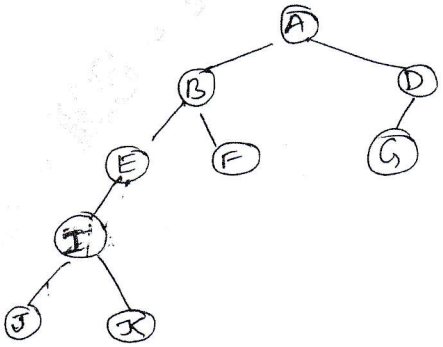

Fig.Q8 **(06 Marks)**

b. Write iterative and recursive search function to search a key in BST. **(08 Marks)**

c. Draw a binary tree for the following expression 3 + 4 * (7 – 6) / 4 + 3. Traverse the tree and obtain pre-order and post order expression. **(06 Marks)**

Module-5

9 a. For the given graph show adjacency matrix and adjacency list representation.

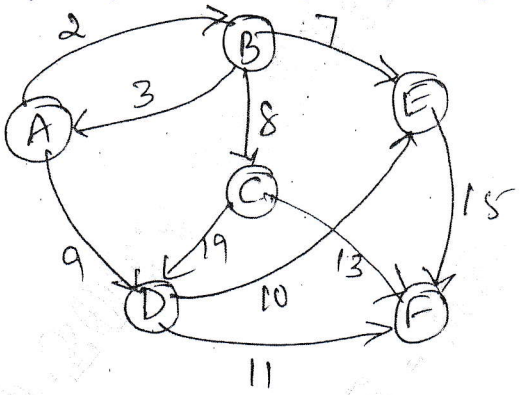

Fig.Q9(a) **(06 Marks)**

b. Write BSF and DFS algorithm for graph traversal. **(10 Marks)**

c. Write a note on AVL tree. **(04 Marks)**

OR

10 a. What is hashing? Explain different hashing function with suitable numerical example. **(08 Marks)**

b. What is collision? Explain the method to resolve collision with suitable algorithm of liner probing. Insert keys 72, 27, 36, 24, 63, 81, 92, 101 into table [size = 10]. **(08 Marks)**

c. Write a note on B-tree. **(04 Marks)**

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21CS33

Third Semester B.E. Degree Examination, June/July 2023
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. With a neat diagram and mathematical analysis explain fixed bias circuit. **(06 Marks)**

b. With hysteresis characteristics explain the working of Inverting Schmitt trigger. **(06 Marks)**

c. Explain current to voltage and voltage to current convertor. **(08 Marks)**

OR

2 a. Discuss Regulated power supply parameters. **(06 Marks)**

b. Explain the working of R-2R ladder D to A convertor. **(06 Marks)**

c. Explain successive approximation A to D convertor. **(08 Marks)**

Module-2

3 a. Minimize the following function using K-map and implement it using basic gates.
$f(A, B, C, D) = \sum m(0, 1, 2, 5, 7, 8, 9, 10, 13, 15)$ **(06 Marks)**

b. Simplify the following function using Quine McClusky method.
$f(A, B, C, D) = \sum m(0, 1, 2, 3, 5, 7, 8, 10, 12, 13, 15)$ **(08 Marks)**

c. Minimize the following function for POS using K-map and realize using basic gains
$f(a, b, c, d) = \pi M(0, 1, 6, 8, 11, 12) + d(3, 7, 4, 15)$ **(06 Marks)**

OR

4 a. With an example explain Petrick's method. **(06 Marks)**

b. Simplify the following function using Quine – McClusky method
$f(A, B, C, D) = \sum m(2, 3, 7, 9, 11, 13) + \sum d(1, 10, 15)$ **(08 Marks)**

c. With the help of flow chart explain how to determine minimum sum of products using Karnaugh map. **(06 Marks)**

Module-3

5 a. Explain with neat diagram static 'O' hazard and how Static-O hazard can be detected and removed with example. **(08 Marks)**

b. What is multiplexer, explain 8-to-1 multiplexer with the help of logic diagram and corresponding expression. **(06 Marks)**

c. Explain with a neat diagram 3:8 decoder. **(06 Marks)**

OR

6 a. Implement the following function using PLA.
$f_1(a, b, c) = \sum m(0, 4, 6, 7)$
$f_2(a, b, c) = \sum m(4, 6)$ **(06 Marks)**

b. Explain seven segment decoder and realize using PLA. **(10 Marks)**

c. Explain simulation and testing of digital circuits. **(04 Marks)**

Module-4

7 a. Explain 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. **(06 Marks)**

c. Explain edge triggered D flip flop. **(06 Marks)**

OR

8 a. Explain J-K Master slave flip flop with suitable timing diagram. **(10 Marks)**

b. Derive the characteristics equations for D, T, SR and JK flip flops. **(10 Marks)**

Module-5

9 a. What is shift register? Explain the works of 8-bit SISO using SR flip flop with Timing diagram. **(10 Marks)**

b. With a block diagram explain the working of n bit parallel adder with accumulator. **(10 Marks)**

OR

10 a. Explain Three bit binary ripple counter with relevant waveforms and truth table. **(10 Marks)**

b. Design a random counter using T flip flop for the following sequence:
000, 100, 111, 010, 011, ... **(10 Marks)**

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21CS34

Third Semester B.E. Degree Examination, June/July 2023
Computer Organisation and Architecture

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Describe basic operation concepts behind working of computers. **(10 Marks)**

b. Write a short notes on :
i) Basic Performance Equation ii) Clock Rate **(10 Marks)**

OR

2 a. Describe the concept of Branching with an example program of instruction execution. **(10 Marks)**

b. Describe various addressing mode with examples. **(10 Marks)**

Module-2

3 a. Explain the interfacing of I/O device with computer. **(10 Marks)**

b. Describe the concept of Interrupt in computer. **(10 Marks)**

OR

4 a. Explain the Direct Memory Access Technique and its importance. **(10 Marks)**

b. Explain with neat timing diagram of an input transfer on a synchronous bus. **(10 Marks)**

Module-3

5 a. Explain basic concepts involved for memory structure of computers. **(10 Marks)**

b. What are various semiconductor memories? Explain in detail the working of Read/Write operation of SRAM. **(10 Marks)**

OR

6 a. Describe the parameters – speed, size and cost with respect to memory. **(10 Marks)**

b. What is a virtual memory? Explain its role. **(10 Marks)**

Module-4

7 a. Explain how a fast adder is designed. **(10 Marks)**

b. Multiply the following number 13*12 . Also draw the multiplier circuit. **(10 Marks)**

OR

8 a. Explain complete execution step for instruction
ADD (R3), R1 **(10 Marks)**

b. Describe the hardwired computer with an example. **(10 Marks)**

Module-5

9 a. Explain the parallel processing concept with a block diagram showing multiple functional units. **(10 Marks)**

b. Explain pipelining technique with an example. **(10 Marks)**

OR

10 a. What is instruction pipeline? Explain four segment instruction pipeline concept. **(10 Marks)**

b. Explain the concept of vector processing. Write few of its application areas. **(10 Marks)**

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CBCS SCHEME

21CIP37/21CIP47

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Question Paper Version : C

Third/Fourth Semester B.E. /B.Tech. Degree Examination, June/July 2023
CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS

[Time: 1 hrs.] [Max. Marks: 50]

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the Fifty 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.

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1. The member to be nominated by the President for the council of states are from,
   a) Literature b) Science c) Sports d) All of these

2. Which of the following Pairs is not property matched ,
   a) 44th Amendment-citizenship act b) 52nd Amendment-Anti Defection Law
   c) 42nd Amendment-Fundamental duties d) 73rd Amendment-Local self Government

3. The speaker of Lok Sabha,
   a) is appointed by the President b) is nominated by the Vice-President
   c) is choosen by the members of Lok Sabha d) is elected by the members of parliament

4. Financial Emergence has been imposed in India,
   a) Once b) Never c) Twice d) Thrice

5. Respect for the National Flag and the National Anthem is,
   a) a Fundamental right b) a Fundamental Duty
   c) a Directive principle d) an ordinary duty

6. A non-member of the state legislature can be the minister for a period not exceeding,
   a) Six month b) One year c) Six weeks d) Three months

7. Engineering ethics is a,
   a) developing ethics b) Preventive ethics
   c) natural ethics d) Scientifically developed ethics

8. Risk estimation can be done by using,
   a) Cooking b) Trimming c) Event tree d) Both (a) and (b)

9. The Patent holder does not allow others to use patented information for _____ years from the date of filing.
a) 25 b) 30 c) 50 d) 20

10. The use of intellectual property of others without their permission or credit is referred to as,
a) Cooking b) Plagiarism c) Patents d) Formulae

11. When was the Indian constitution enacted and adopted?
a) 26/10/1949 b) 26/11/1949 c) 26/4/1949 d) 26/01/1950

12. 'We the people of India' are the opening words of the,
a) Preamble of the Indian constitution b) Article 21 of the Indian constitution
c) Fundamental rights d) Directive principles of state policy

13. Which one of these is the primary source of the Indian constitution?
c) British constitution b) Irish constitution
c) Charter Act of 1833 d) Government of India Act of 1935

14. The original Indian constitution had :
a) 12 parts, 6 schedule and 320 Articles b) 20 parts, 8 schedule and 380 Articles
c) 12 parts, 8 schedule and 396 Articles d) 12 parts, 10 schedule and 300 Articles

15. The word 'Sovereign' means that,
a) Supreme in nature b) A country is under dictatorship
c) A country is poor of weak d) A country is strong and powerfull

16. Directive principles are,
a) Justiciable b) Not practiced at rural levels
c) Non-justiciable d) Associated to the Government worker's

17. How much time was taken for training the constitution?
a) 1 year, 11 months, 18 days b) 5 year, 11 months, 18 days
c) 2 year, 11 months, 18 days d) 3 year, 11 months, 18 days

18. India is a Sovereign, socialist, selular, democratic and republic in the Indian constitution this expression occurs in,
a) Citizenship b) Preamble
c) Fundamental rights d) Directive principles

19. Who among the following is the supreme commander of the Armed forces?
a) Air Chief Marshal b) Prime Minister
c) Defense Minister d) President

20. The 91st Amendment Act (2003) is associated with,
a) Size of the council of ministers b) Primary education
c) Fundamental Duty d) Powers of the President

21. Which of the following is not the concept of responsibilities?
a) Minimalist b) Reasonable care c) Utilitarianism d) Good works

22. Lying means,
a) Intentionally conveying false information to others b) Fabrication
c) Plagarism d) All of these

23. The three types of Justice reffered in our preamble are :
a) Social, Economic and Religious b) Social, Economic and Natural
c) Social, Economic and International d) Social, Economic and Political

24. An arrested person must be produced before a magistrate within _____ hours of arrest.
a) 12 b) 24 c) 36 d) 48

25. Election commission conducts the election as per which act?
a) Parliament act b) People's representative act of 1982
c) Code of conduct act d) State representative act

26. When the office of the president, falls vacant, the same must be filled up with in?
a) 3 months b) 6 months c) 1 year d) 9 months

27. Who among the following are not entitled to form Union or Association,
a) Police b) Teachers c) Workers d) Doctors

28. The MLA's of various state legislative assemblies are varying between,
a) 40 to 450 b) 50 - 500 c) 28 - 12 d) 60 - 500

29. A bill cannot become an act of parliament, unless and until _____?
a) it is passed by Lok Sabha b) it is passed by Rajya Sabha
c) it gets assent from President d) it gets approved by Supreme Court

30. Who hoisted the National Flag during 74th Republic day function in New Delhi?
a) Prime Minister b) President
c) Vice-President d) Chief justice of India

31. The tenure of the Council of state is,
a) Not subject to dissolution b) 2 years c) 5 years d) 4 years

32. When elections are held in one or a few constituencies due to death or resignation of candidates, it is called as _____.
a) General election b) Primary election
c) By election d) Midterm election

33. Fundamental Rights are borrowed from the constitution of,
a) UK b) USA c) Germany d) Ireland

34. What is the minimum age to become Judges of Supreme Court of India?
a) 25 years b) 30 years c) 35 years d) None of these

35. The Indian constitution gives the power of amending the constitution to,
a) The people of India b) The president
c) The Parliament d) Supreme Court of India

36. Right to Education (RTE) was introduced in _____ Amendment,
a) 86th b) 42nd c) 44th d) 61st

37. How many types of writs can be issued by the Supreme Court for the protection of Fundamental Rights?
a) Four b) Five c) One d) Six

38. Who presides over the sessions of Rajya Sabha?
a) Speaker b) Home minister c) Vice-president d) President

39. Who appoints the Vice-Chancellors of the state universities?
a) Education minister b) District commissioner c) Chief minister d) Governor

40. Election commission is a _____ body and the term of election commission is _____ years or _____ years of age whichever is earliear.
a) Uni-member, 4 years or 62 years b) Multi-member, 6 years or 65 years
c) Constitutional body, 5 years or 60 years d) None of these

41. How many members were nominated to the parliament by the president of India?
a) 14 members b) 12 members c) 2 members d) 6 members

42. Who among the following distribute portfolious for the council of minister,
a) President b) Vice president c) Prime Minister d) Speaker of Lok Sabha

43. The chief justice and other judges of the supreme court hold office till they complete,
a) Sixty years b) Sixty five years c) Sixty two years d) Seventy years

44. The council of ministers are responsible to the,
a) Rajya Sabha b) Vidhan Parshid c) Lok Sabha d) Supreme court

45. The Vice-President of India is elected by the,
a) Judges of the supreme court b) President
c) Prime Minister d) Members of parliament

46. Who can issue ordinance when the parliament is not in session:
a) President b) High court judges c) Home minister d) Finance minister

47. In case of the violation of the Fundamental Rights we may approach the,
a) Civil Courts b) Supreme Court c) High Court d) Both (a) and (b)

48. Which of the following equalities is/are included in the Right to Equality?
a) Equality before law b) Equal protection of law
c) Equal opportunities in the public employment d) All of these.

49. Prohibition of trafficking in human beings and forced labour comes under which of the following fundamental right?
a) Right to freedom b) Right against exploitation
c) Cultural & Educational Right d) Right to equality.

50. There is no provision in the constitution for the impeachment of the,
a) President b) Vice President c) Governor d) Supreme court Judges

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