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 $\frac{\partial t}{\partial y} - \frac{d}{dx}\left(\frac{\partial t}{\partial yl}\right) = 0$. **(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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CBCS SCHEME

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21ME32

Third Semester B.E. Degree Examination, June/July 2023
Metal Casting, Forming and Joining Processes

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. List the different types of pattern. Explain match plate pattern with a neat sketch. **(07 Marks)**
b. Briefly discuss the importance of binders and additives in sand moulding. **(07 Marks)**
c. With a neat sketch explain Jolt type of Molding machine. **(06 Marks)**

OR

2 a. With a neat sketch explain shell moulding process. **(10 Marks)**
b. What is core? Explain the need of core. **(04 Marks)**
c. Draw a neat sketch of gating system showing all the elements. **(06 Marks)**

Module-2

3 a. With a neat sketch explain the different zones present in CUPOLA furnace. **(12 Marks)**
b. With a neat sketch explain Direct electric arc furnace. **(08 Marks)**

OR

4 a. What is die casting? With a neat sketch explain gravity die casting process. **(10 Marks)**
b. With a neat sketch explain continuous casting process. **(10 Marks)**

Module-3

5 a. Differentiate between hot working and cold working process. **(04 Marks)**
b. With a sketch explain Gravity (or) board drop hammer. **(06 Marks)**
c. Explain with a sketches any four type of rolling mills. **(10 Marks)**

OR

6 a. With respect to sheet metal forming explain :
(i) Blanking process
(ii) Bending process. **(04 Marks)**
b. With a sketches explain progressive die and compound die. **(08 Marks)**
c. With a sketch explain explosive high energy rate forming process. **(08 Marks)**

Module-4

7 a. With a neat sketch explain Gas Welding process. Also explain types of flames used in gas welding. **(12 Marks)**
b. With a neat sketch explain manual metal arc welding. **(08 Marks)**

OR

8 a. With a sketch explain Gas tungsten arc welding process. **(10 Marks)**
b. With a sketch explain Submerged arc welding. **(10 Marks)**

Module-5

9 a. Define Weldability. With respect to the thermal aspects explain the following :
(i) Distortion (i) Shrinkage (iii) Residual stresses. **(12 Marks)**

b. Briefly explain welding defects and their remedies. **(08 Marks)**

OR

10 a. Explain the following Joining Processes.
i) Soldering
ii) Brazing
iii) Adhesive bonding **(12 Marks)**

b. Explain with a sketch Resistance arc welding process. Also mention their advantages and limitations. **(08 Marks)**

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CBCS SCHEME

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21ME33

Third Semester B.E. Degree Examination, June/July 2023
Material Science and Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Classify Engineering Materials. Explain them with examples. **(08 Marks)**
b. Differentiate between crystalline and non-crystalline solids. **(07 Marks)**
c. Explain the various geometrical crystal rotation geometry operations. **(05 Marks)**

OR

2 a. Define unit cell and crystal lattice. Explain the cubic, tetragonal, orthorhombic and rhobhohedral unit cells with examples. **(10 Marks)**
b. Define atomic packing factor. Calculate APF of FCC unit cell. **(05 Marks)**
c. Define crystal imperfections in solids. Explain point imperfections. **(05 Marks)**

Module-2

3 a. Classify and explain solid solutions. What are intermediate phases? **(10 Marks)**
b. Explain Hume – Rothery rules. **(04 Marks)**
c. Explain (i) Gibb's phase rule (ii) Level rule. **(06 Marks)**

OR

4 a. Explain the eutectic system binary phase diagram for two metals completely soluble in liquid state but completely insoluble in solid state. **(10 Marks)**
b. Explain the two Fick's laws of diffusion. **(04 Marks)**
c. Explain the role of imperfections in diffusions. **(06 Marks)**

Module-3

5 a. Explain the homogeneous and heterogeneous nucleation process with a suitable sketch or graph or equations. **(10 Marks)**
b. Explain the plastic deformation by :
(i) Slip (ii) Twinning. **(06 Marks)**
c. Define and classify strengthening mechanisms. Explain anyone method. **(04 Marks)**

OR

6 a. Differentiate between Annealing and Normalising. **(05 Marks)**
b. With sketch, explain the flame hardening process. **(05 Marks)**
c. Explain the TTT diagram for 0.8% C eutectoid steel. **(10 Marks)**

Module-4

7 a. Classify surface coating methods. Explain the electrochemical coating method. **(08 Marks)**
b. Explain the various surface coating materials. **(06 Marks)**
c. What are the advantages and disadvantages of powder metallurgy? **(06 Marks)**

OR

8 a. Explain the characteristics of metal powders with regard to particle size and shape distribution. **(06 Marks)**

b. Explain : (i) Powder compacting process (ii) Powder sintering process. **(08 Marks)**

c. What are the applications of powder metallurgy? **(06 Marks)**

Module-5

9 a. Explain the evolution of engineering materials. **(06 Marks)**

b. Explain the design process with a suitable flow chart. **(08 Marks)**

c. With sketch, explain the design tools and materials data. **(06 Marks)**

OR

10 a. Classify engineering materials. Explain them with examples. **(10 Marks)**

b. Classify material property charts. Sketch and explain the Young's modulus – density chart. **(10 Marks)**

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CBCS SCHEME

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21ME34

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

Time: 3 hrs. Max. Marks: 100

Note: 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *Use of Thermodynamic Data Hand book is permitted.*

Module-1

1 a. Explain different types of temperature scales. **(04 Marks)**

b. Derive an expression for PdV work for an isentropic process. **(08 Marks)**

A thermo couple with test junction at $1^{\circ}C$ on a gas thermo meter scale and reference junction at ice point gives the emf as $e = (0.3t - 4\times10^{-4}t)mV$. The millimeter is calibrated at ice and steam points. What will be the reading on this thermometer when gas thermometer reads $80^{\circ}C$? **(08 Marks)**

OR

2 a. Obtain the expression for displacement work,
(i) Isothermal process
(ii) Polytropic process.
(iii) Isobaric process
(iv) Isochronic process. **(10 Marks)**

b. A piston-cylinder arrangement contains a fluid system which passes through a complete cycle of four process. During a cycle, the sum of all heat transfer is $-170kJ$. The system completes 100 cycles per minute. Complete the following table and compute the net rate of work in K.

Process	Q KJ/min	W KJ/min	ΔE KJ/min
AB	0	2170	-
BC	21000	0	-
CD	2100	-	36600
DA	-	-	-

(10 Marks)

Module-2

3 a. Give Kelvin Plank and Clausius statements of second law of thermodynamics. **(04 Marks)**

b. Show that entropy is a property of system. **(06 Marks)**

c. A heat engine working on a Carnot cycle absorbs heat from three thermal reservoirs at 1000 K, 800 K and 600 K respectively. The engine does 10 kW of net work and rejects 400 kJ/min of heat to the sink at 300 K if the heat supplies by the reservoir at 1000 K is 60% of heat supplied by the reservoir at 600 K. Find the quantities of heat supplies by each reservoirs. **(10 Marks)**

OR

4 a. State and prove Clausius inequality. **(08 Marks)**

b. State and Carnot's theorem. **(02 Marks)**

c. Heat is transferred by conduction from a reservoir at 500°K to a reservoir at 300°K at the rate of 100 kJ/min. Evaluate $\oint \frac{\delta Q}{T}$. What will be $\oint \frac{\delta Q}{T}$ if reversible heat engine operates between these two reservoirs? How much work would be have been done by the engine. **(10 Marks)**

Module-3

5 a. Write Maxwell equations and explain the terms involved. **(06 Marks)**

b. Define : (i) Sub cooled liquid (ii) Tripple point (iii) Critical point. **(06 Marks)**

c. Super heated steam from initial condition of 5 bar and 300°C is expanded isentropically to a pressure of 0.5 bar. Calculate (i) Final condition of steam after expansion (ii) Change in enthalpy / kg of steam (iii) Change in internal energy / kg of steam. **(08 Marks)**

OR

6 a. With a neat sketch, explain working of a combined separating and throttling calorimeter. **(10 Marks)**

b. Steam at 10 bar and dry state is cooled under constant pressure until it becomes 0.85 dry. Using steam tables find the work done, change in enthalpy, heat transfer and change in entropy. **(10 Marks)**

Module-4

7 a. Define :

(i) Mole fraction.
(ii) Mass fraction.
(iii) Dalton's law.
(iv) Amagat's law of additives **(10 Marks)**

b. A mixture of gases contain 1 kg of CO_2 and 1.5 kg of N. The pressures and temperature of the mixture are 3.5 bar and 27°C. Calculate

(i) Mole fraction of each constituent.
(ii) Partial pressure.
(iii) Partial value.
(iv) Volume of mixture.
(v) Density of mixture **(10 Marks)**

OR

8 a. Derive an expression of air standard efficiency of diesel cycle with neat PV and TS diagrams. **(10 Marks)**

b. An engine with 200 mm cylinder and 300 mm stoke length works on diesel cycle. The initial pressure and temperature of air are 0.1 MPa and 27°C. The cut off is 8% of stoke volume and compression ratio is 15. Calculate

(i) Pressure and temperature of salient points.
(ii) Air standard efficiency. **(10 Marks)**

Module-5

9 a. Draw a neat PV and TS diagram of air standard dual cycle and derive an expression for air standard efficiency interms of compression ratio, explosion ratio and cut off ratio under what conditions the dual cycle becomes otto cycle and diesel cycle. **(10 Marks)**

b. An air standard diesel cycle has compression ratio 16. The temperature before compressor is $27^{\circ}C$ and the temperature after expansion is $627^{\circ}C$. Compute
   (i) Cut off ratio.
   (ii) The net work output per unit mass of air.
   (iii) Thermal efficiency.
   (iv) Mean effective pressure in bar. **(10 Marks)**

OR

10 a. Explain any two methods of improving the efficiency of an open cycle gas turbine plant. **(10 Marks)**

b. In an open cycle gas turbine plant air enters the compressor at 1 bar and $27^{\circ}C$. The pressure of after compression is 4 bar. The isentropic efficiency of the turbine and compressor are 85%, 80% and air fuel ratio is 80%. The calorific value of fuel used is 42000 kJ/kg and mass flow rate is 2.5 kg/s. Calculate the power output from the plant and the cycle efficiency. Assume that C_P and γ to be same for both air and products of combustion. **(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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