CBCS SCHEME

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17MAT31

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Engineering Mathematics – III

Time: 3 hrs. Max. Marks: 100

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

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.

Module-1

1 a. Obtain the Fourier series of $f(x) = x(2\pi - x)$ in $0 \le x \le 2\pi$. **(08 Marks)**

b. Obtain the Fourier series for the function $f(x) = \begin{cases} 1 + 4\frac{x}{3} \text{ in } -\frac{3}{2} < x \le 0 \\ 1 - 4\frac{x}{3} \text{ in } 0 \le x < \frac{3}{2} \end{cases}$ **(06 Marks)**

c. Expand $f(x) = 2x - 1$ as a Cosine half range Fourier series in $0 < x < 1$. **(06 Marks)**

OR

2 a. Obtain the constant term and the coefficients of the first Cosine and Sine terms in the Fourier expansion of 'y' from the table

x	0	1	2	3	4	5
y	9	18	24	28	26	20

(08 Marks)

b. Obtain the Fourier series of $f(x) = |x|$ in $-\pi \le x \le \pi$. **(06 Marks)**

c. Show that the sine half range series for the function $f(x) = \ell x - x^2$ in $0 < x < \ell$ is $\frac{8\ell^2}{\pi^3} \sum_0^\infty \frac{1}{(2n+1)^3} \text{Sin}\left(\frac{2n+1}{\ell}\right)\pi x$. **(06 Marks)**

Module-2

3 a. If $f(x) = \begin{cases} 1 \text{ for } |x| \le a \\ 0 \text{ for } |x| > a \end{cases}$, find the infinite Fourier transform of f(x) and hence evaluate $\int_0^\infty \frac{\text{Sin } x}{x} dx$. **(08 Marks)**

b. Find the Fourier Cosine transform of e^{-x}. **(06 Marks)**

c. Solve by using Z-transforms: $y_{n+2} - 4y_n = 0$, given $y_0 = 0$ and $y_1 = 2$. **(06 Marks)**

OR

4 a. Find the Fourier Sine transform of $\frac{e^{-ax}}{x}$, $a > 0$. **(08 Marks)**

b. Find the Z-transform of Sin (3n + 5). **(06 Marks)**

c. Find the inverse Z-transform of $\frac{2z^2 + 3z}{(z+2)(z-4)}$. **(06 Marks)**

Module-3

5 a. Find the coefficient of correlation for the data

x	1	3	4	2	5	8	9	10	13	15
y	8	6	10	8	12	16	16	10	32	32

(08 Marks)

b. Fit a straight line to the following data

Year	1961	1971	1981	1991	2001
Production (in tons)	8	10	12	10	16

(06 Marks)

c. Compute the real root of $x \log_{10} x - 1.2 = 0$ by Regula – Falsi method. Carry out three iterations in (2, 3). (06 Marks)

OR

6 a. Obtain the lines of Regression for the following values of x and y

x	1	2	3	4	5
y	2	5	3	8	7

(08 Marks)

b. Fit an exponential curve of the form $y - ae^{bx}$ for the following data

No. of petals	5	6	7	8	9	10
No. of flowers	133	55	23	7	2	2

(06 Marks)

c. Find a real root of $x \operatorname{Sin} x + \operatorname{Cos} x = 0$ near $x = \pi$. Correct to four decimal places, using Newton – Raphson method. (06 Marks)

Module-4

7 a. Given Sin 45° = 0.7071, Sin 50° = 0.7660, Sin 55° = 0.8192, Sin 60° = 0.8660, find Sin 57° using an appropriate interpolation formula. (08 Marks)

b. Use Newton's divided difference formula to find f(4) given the data

x	0	2	3	6
f(x)	–4	2	14	158

(06 Marks)

c. Using Simpsons 1/3rd rule, evaluate $\int_0^{\pi/2} \sqrt{\operatorname{Cos}\theta}\, d\theta$ by dividing $[0, \pi/2]$ in to 6 equal parts. (06 Marks)

OR

8 a. From the following table find the number of students who have obtained less than 45 marks

Marks	30-40	40-50	50-60	60-70	70-80
No. of Students	31	42	51	35	31

(08 Marks)

b. Using Lagrange's interpolation formula fit a polynomial of the form x = f(y)

x	2	10	17
y	1	3	4

(06 Marks)

c. Evaluate $\int_0^1 \frac{x}{1+x^2} dx$ by Weddle's rule taking seven ordinates. (06 Marks)

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Module-5

9 a. Verify Green's theorem in a plane for $\oint_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$, where 'C' is the boundary of the region enclosed by $y = \sqrt{x}$ and $y = x^2$. **(08 Marks)**

b. Verify Stoke's theorem for $\vec{F} = (x^2 + y^2)i - 2xyj$ taken round the rectangle bounded by the lines $x = \pm a$, $y = 0$ and $y = b$. **(06 Marks)**

c. Derive Euler's equation $\frac{\partial t}{\partial y} - \frac{d}{dx}\left[\frac{\partial t}{\partial y^1}\right] = 0$. **(06 Marks)**

OR

10 a. Use Gauss divergence theorem to evaluate $\iint_S \vec{F}.\hat{n}\,ds$ over the entire surface of the region above xy plane bounded by the cone $z^2 = x^2 + y^2$ the plane $z = 4$ where $\vec{F} = 4xz\,i + xyz^2\,j + 3z\,K$. **(08 Marks)**

b. Prove that geodesics of a plane are straight lines. **(06 Marks)**

c. Find the extremal of the functional $\int_0^{\pi/2} (y^2 - y^{1^2} - 2y\,Sinx)\,dx$ under the end conditions $y(0) = y(\pi/2) = 0$. **(06 Marks)**

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17EC32

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Electronic Instrumentation

Time: 3 hrs. Max. Marks: 100

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

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.

Module-1

1 a. Define the following with examples : i) Accuracy ii) Precision iii) Resolution iv) Significant figures v) Absolute error. **(05 Marks)**

b. Explain basic DC Ammeter and design multirange ammeter to measure 0-10mA, 0-2mA, 0-50mA having basic meter with full scale deflection of 1mA and internal resistance 100Ω. **(10 Marks)**

c. Explain true RMS voltmeter with a neat diagram. **(05 Marks)**

OR

2 a. Write a short note on loading of voltmeter and find :
i) Voltage across R2 using meter1 and meter2 in the following Fig.Q2(a)(i).

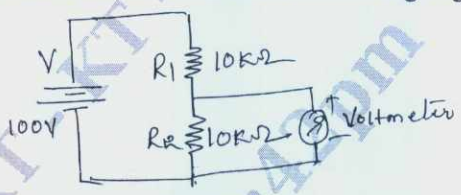

Fig.Q2(a)(i)

ii) Which meter provides the accurate result?
iii) Error in the voltmeters.
Given that meter 1 : 1000Ω/V over range 50V
meter 2 : 20000Ω/V over range 50V. **(10 Marks)**

b. Explain AC voltmeter with full wave rectifier and compute the value of multiplier for 100Vms input for full wave rectifier voltmeter with basic meter having full scale deflection of 1mA and internal resistance 500Ω. **(07 Marks)**

c. Write a note on measurement error combinations. **(03 Marks)**

Module-2

3 a. Explain the basic principle used in ADC. **(05 Marks)**

b. With the help of neat diagram, explain dual slope integrating type DVM. Mention specifications of DVM. **(10 Marks)**

c. Explain Digital pH-meter. **(05 Marks)**

OR

4 a. Explain digital frequency meter with the help of block diagram. **(10 Marks)**

b. Explain digital Tachometer. **(05 Marks)**

c. What do you mean by 3½ digit display? Explain. What is the resolution of 3½ digit DDM over IV range and 10V range. **(05 Marks)**

Module-3

5 a. Explain the block diagram of CRO. **(07 Marks)**

b. Explain Digital Storage Oscilloscope. **(07 Marks)**

c. Explain the working of AF Sine and Square Wave Generator. **(06 Marks)**

OR

6 a. With the help of neat block diagram, explain Function Generator. **(08 Marks)**
b. Explain the working of Standard Signal Generator. **(07 Marks)**
c. Discuss frequency measurements with Lissajous figures. **(05 Marks)**

Module-4

7 a. Explain Q-meter with suitable circuit diagram. **(08 Marks)**
b. With neat circuit diagram explain phase meter. **(08 Marks)**
c. Obtain the balance equations for capacitance comparision bridge. **(04 Marks)**

OR

8 a. Explain the Wheat Stone bridge and using Thevenin's theorem, determine the amount of deflection due to unbalance of Wheat Stone bridge. **(10 Marks)**
b. In the following Fig.Q8(b) ratio of Ra to Rb is 1000Ω, $R_1 = 5\Omega$, $R_1 = 0.5R_2$. Find Rx.

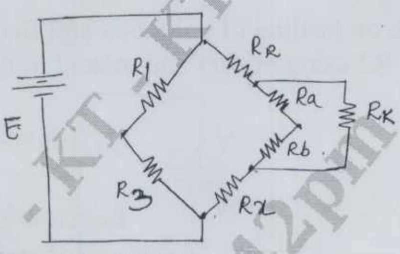

Fig.Q8(b) **(05 Marks)**

c. Explain Megger circuit. **(05 Marks)**

Module-5

9 a. What are the factors to be considered while selecting a better transducer? Explain. **(08 Marks)**
b. Explain LVDT and show characteristic curve along with its applications. **(07 Marks)**
c. Explain Piezoelectric transducer. **(05 Marks)**

OR

10 a. Explain Semiconductor photodiode and transistor. **(07 Marks)**
b. What is resistance thermometer? Explain. **(06 Marks)**
c. A displacement transducer with a shaft stroke of 3.0 inch is applied to the following circuit shown in Fig.Q10(c). The total resistance of potentiometer is 5KΩ, applied voltage is 5V. When the Wiper is 0.9 inch from B, what is the total output voltage?

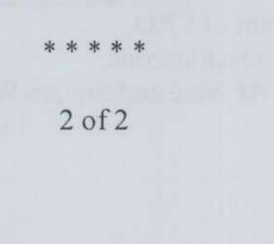

Fig.Q10(c) **(07 Marks)**

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17EC33

Third Semester B.E. Degree Examination, Jan./Feb. 2021

Analog Electronics

Time: 3 hrs. Max. Marks: 100

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

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.

Module-1

1 a. What is BJT transistor modeling? Obtain the expression for voltage gain, Z_{in} and Z_o of CB configuration using AC equivalent circuit with re model. **(05 Marks)**

b. Derive the expression for A_i, A_v, Z_i and Z_o for a voltage divider bias circuit of BJT, with unbypassed RE, using re equivalent model of BJT. Show the phase relationship between input and output wave form. **(10 Marks)**

c. State the characteristic features of Darlington connection. Calculate the DC bias voltages and currents in the circuit.

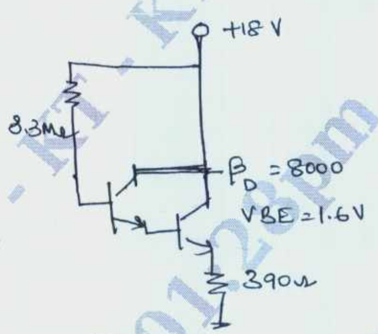

Fig.Q1(c) **(05 Marks)**

OR

2 a. Give the relation between re parameters and h parameters. What are the advantages of h parameters? **(05 Marks)**

b. Derive the expressions for current gain, voltage gain, input impedance and output impedance for an emitter follower circuit using approximate hybrid equivalent circuit. (Without the effect of r_o). **(10 Marks)**

c. For the network shown in Fig.Q2(c), determine re, Z_i, Z_o, A_v (with $r_o = \infty\Omega$) and A_v (with $r_o = 50\ K\Omega$)

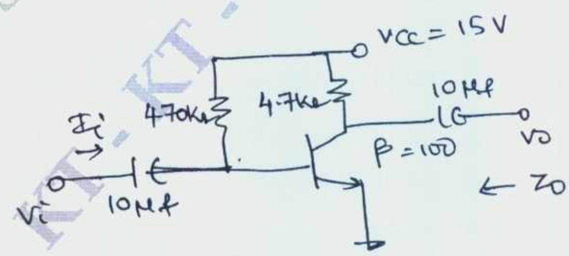

Fig.Q2(c) **(05 Marks)**

Module-2

3 a. Explain the construction of N channel JFET. Also explain the drain and transfer characteristics of the JFET. **(06 Marks)**

b. With equivalent circuit obtain the expression for Z_o and A_v for JFET self bias configuration. **(08 Marks)**

c. The fixed bias configuration shown in Fig.Q3(c) has $V_{GSQ} = -2V$, $I_{DQ} = 5.625$ mA with $I_{DSS} = 10$ mA, $V_P = -8V$ and $Y_{OS} = 40\ \mu S$. Determine g_m, r_d, Z_o and A_v.

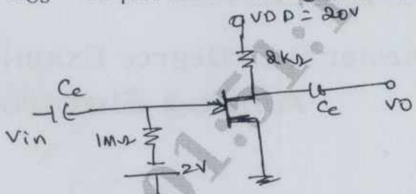

Fig.Q3(c) **(06 Marks)**

OR

4 a. Differentiate between enhancement and depletion MOSFET. **(05 Marks)**

b. With necessary equivalent circuit, obtain the expression for A_v for a JFET source follower configuration. **(05 Marks)**

c. Calculate the DC bias, voltage gain, input impedance and output impedance and resulting output voltage for the cascade amplifier shown in Fig.Q4(c). Calculate the load voltage if a 10 KΩ load is connected across the output.

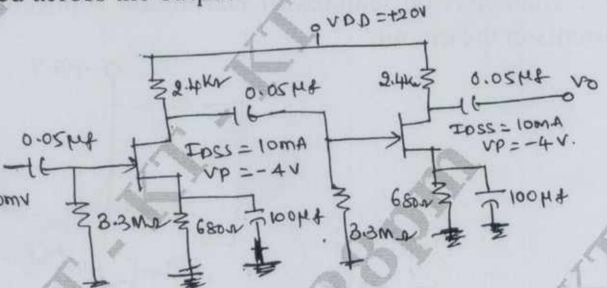

Fig.Q4(c) **(10 Marks)**

Module-3

5 a. Determine the lower cutoff frequency f_{LS} for the voltage divider bias network using the following parameters:
$C_S = 10\ \mu f$, $C_E = 20\ \mu f$, $C_C = 1\ \mu f$, $R_S = 1$ KΩ, $R_1 = 40$ KΩ, $R_2 = 10$ KΩ, $R_E = 2$ KΩ, $R_C = 4$ KΩ, $R_L = 2.2$ KΩ, $\beta = 100$, $r_o = \infty\Omega$, $V_{CC} = 20$ V, re = 15.76 Ω. **(04 Marks)**

b. Explain the following: (i) Logarithm (ii) Decibel. With respect to transistor amplifier calculate the overall lower 3 dB and upper 3 dB frequencies for a 3 stage amplifier having an individual $f_l = 40$ Hz and $f_2 = 2$ MHz. **(06 Marks)**

c. Discuss the low frequency response of BJT amplifier and give expression for lower cut off frequency due to C_C, C_E and C_S. **(10 Marks)**

OR

6 a. Draw the Hybrid π model for the transistor in CE configuration and explain the significance of each component. **(06 Marks)**

b. Describe the Miller effect and derive an equation for Miller input capacitance. **(06 Marks)**

c. Determine the high cutoff frequencies for the network shown in Fig.Q6(c).

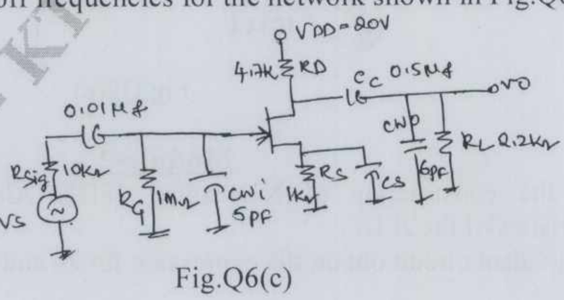

Fig.Q6(c) **(08 Marks)**

Module-4

7 a. With a block diagram, explain the concept of feedback amplifier and derive the expression for $A_f = \frac{A}{1+A\beta}$. **(06 Marks)**

b. Derive the expression for Z_{if} and Z_{of} for current series feedback amplifier. **(08 Marks)**

c. Explain a practical voltage series feedback circuit. **(06 Marks)**

OR

8 a. What is an oscillator? Discuss the concept of generating oscillations with the help of Barkhausen criteria. **(05 Marks)**

b. With a neat circuit diagram and necessary expressions, explain the Wein bridge oscillator. **(10 Marks)**

c. Design a unijuction transistor for a operation at 1 kHz and 150 kHz assuming $\eta = 0.58$. **(05 Marks)**

Module-5

9 a. Give the definition of power amplifiers and list the types of power amplifiers based on the location of Q point. **(05 Marks)**

b. Explain the working of class B complementary symmetry class B push pull amplifier. Obtain an expression for maximum conversion efficiency of this amplifier. **(10 Marks)**

c. Calculate the harmonic distortion components for an output signal having fundamental amplitude of 2.5 V, second harmonic amplitude of 0.25 V, third harmonic amplitude of 0.1 V and fourth harmonic amplitude of 0.05 V and also calculate the total harmonic distortion for the amplitude components given above. **(05 Marks)**

OR

10 a. With necessary circuit diagram and characteristic curve, explain the class-A transformer coupled amplifier. Show that the maximum efficiency can be expressed as 50%. **(10 Marks)**

b. Describe the block diagram of series and shunt type voltage regulators. **(05 Marks)**

c. Calculate the output voltage and Zener current un the regulator circuit of Fig.Q10(c) for $R_L = 5\ K\Omega$.

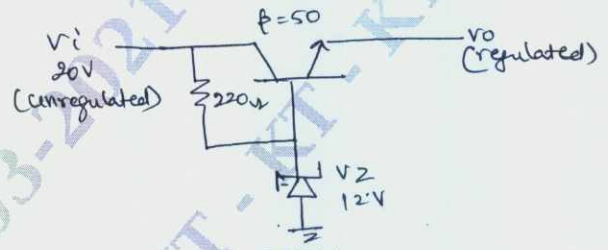

Fig.Q10(c) **(05 Marks)**

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17EC34

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Digital Electronics

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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Module-1

1 a. Define the following:
i) Combinational circuit
ii) Sequential circuit
iii) Canonical SOP
iv) Canonical POS
v) Prime Implicant
vi) Essential prime implicant. **(08 Marks)**

b. Express the following equations into decimal notations:
i) $H = f(A, B, C) = A'BC + A'BC + ABC$
ii) $T = f(a, b, c) = (a + b' + c)(a + b' + c')(a' + b' + c)$ **(08 Marks)**

c. Write mirror image version 5-variable K-map. **(04 Marks)**

OR

2 a. Obtain minimal expression using k-map for the following incompletely specified function $F(a, b, c, d) = \sum m(0, 1, 4, 6, 7, 9, 15) + \sum d(3, 5, 11, 13)$ and draw circuit diagram using gates. **(10 Marks)**

b. Simplify the following using Quine-Mcclusky method
$s = f(w, x, y, z) = \sum(1, 3, 13, 15) + \sum d(8, 9, 10, 11)$ **(10 Marks)**

Module-2

3 a. Explain the analysis and design procedure for combinational circuit with example. **(10 Marks)**

b. Implement full substractor using 3:8 decoder and write truth table. **(10 Marks)**

OR

4 a. Design full adder using i) 8:1 MUX ii) 4:1 MUX. **(10 Marks)**

b. Design 4 to 16 decoder using 3 to 8 decoder. **(05 Marks)**

c. Explain look ahead carry adder and give its advantages and disadvantages. **(05 Marks)**

Module-3

5 a. What is flipflop? Discuss working principle of SR flipflop with its TT and write characteristics equations. **(10 Marks)**

b. Sketch timing diagram for JK flipflop and D-flipflop. **(05 Marks)**

c. Explain the operation of a switch debouncer built using SR-latch with the help of waveforms. **(05 Marks)**

OR

6 a. Explain the working of a master-slave JK flip-flop with timing diagram. Show how race around condition is eliminated. **(10 Marks)**

b. Explain setup time, hold time and propagation delay for timing considerations. **(05 Marks)**

c. Write characteristics equation for D and T flip-flop. **(05 Marks)**

Module-4

7 a. Explain with diagram, operation and waveforms Serial In Serial Out (SISO) shift left mode register. **(10 Marks)**

b. Design BCD ripple counter using JK flip-flop. **(10 Marks)**

OR

8 a. Design an synchronous mod 5 counter using JK flip-flop and draw its timing diagram. **(10 Marks)**

b. Explain ring counter with timing sequence. **(05 Marks)**

c. Write a note on Johnson counter. **(05 Marks)**

Module-5

9 a. Draw and explain the block diagram of Moore and Mealy model with example and also compare both. **(10 Marks)**

b. Define, present state, next state, state diagram state table and state assignment. **(05 Marks)**

c. Draw and explain Moore JK-flipflop state diagram. **(05 Marks)**

OR

10 a. Analyze the synchronous sequential circuit show below in Fig.Q.10(a).

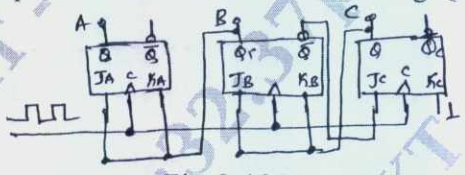

Fig.Q.10(a)

(12 Marks)

b. Design a synchronous counter using JK flipflops to count the sequence 0, 1, 2, 4, 5, 6, 0, 1, 2. Use state diagram and state table. **(08 Marks)**

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17EC35

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Network Analysis

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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Module-1

1 a. Define controlled source and mention its types. Also, mention its applications. **(05 Marks)**

b. Using source shift and source transformations, determine the voltage across the current source in Fig Q1(b).

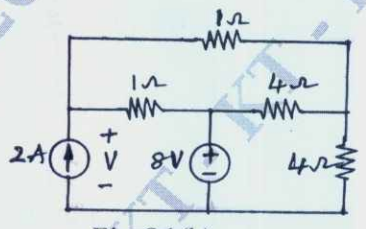

Fig Q1(b) **(05 Marks)**

c. For the circuit of Fig Q1(c), use nodal analysis to determine the voltage labeled V_x

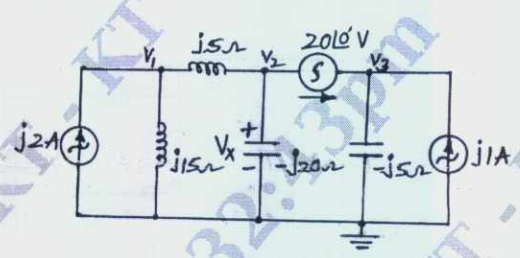

Fig Q1(c) **(10 Marks)**

OR

2 a. Define and explain supermesh. **(04 Marks)**

b. Use Star-Delta transformations to find the equivalent resistance at AB in Fig Q2(b).

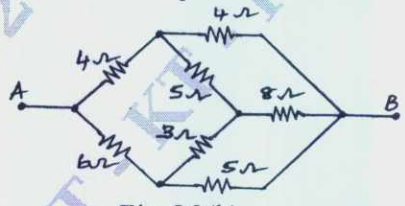

Fig Q2(b) **(06 Marks)**

c. Use Mesh analysis to determine V_1 and the power being supplied by the dependent current source in the circuit shown in Fig Q2(c).

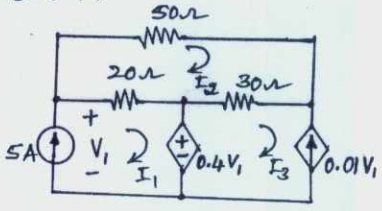

Fig Q2(c) **(10 Marks)**

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Module-2

3 a. State and explain Millman's theorem for AC circuit. **(05 Marks)**

b. Use superposition on the circuit shown in Fig Q3(b) to find the current i_x.

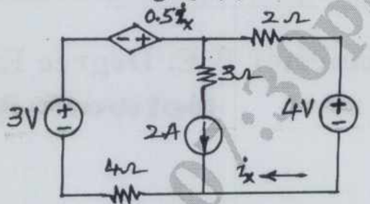

Fig Q3(b) **(05 Marks)**

c. Use Norton's theorem for the circuit of Fig Q3(c) to determine the power absorbed by the 20Ω resistor.

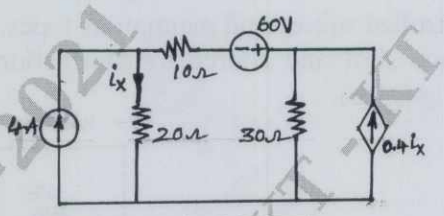

Fig Q3(c) **(10 Marks)**

OR

4 a. State and prove maximum power transfer theorem for AC voltage source with internal impedance connected to variable impedance. **(06 Marks)**

b. Verify reciprocity theorem for the circuit of Fig Q4(b).

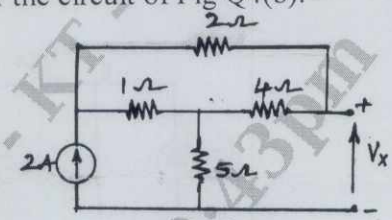

Fig Q4(b) **(04 Marks)**

c. For the circuit of Fig Q4(c), what value of R_L will absorb a maximum average power, and what is the value of this power?

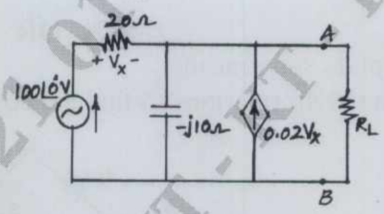

Fig Q4(c) **(10 Marks)**

Module-3

5 a. Explain the behavior of R, L and C elements for transients. Mention their representation at $t = 0^+$ **(06 Marks)**

b. In the network of the Fig Q5(b), is in the steady state with the switch K closed. At t = 0, the switch is opened. Find the values of v_1, v_2, $\frac{dv_1}{dt}$ and $\frac{dv_2}{dt}$ at $t = 0^+$.

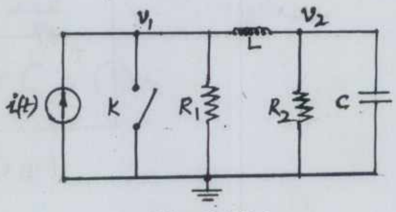

Fig Q5(b) **(08 Marks)**

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c. Find the Laplace transform of the waveform shown in Fig Q5(c)

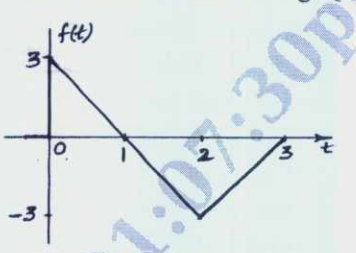

Fig Q5(c) **(06 Marks)**

OR

6 a. In the network of the Fig Q6(a), a steady state is reached with the switch K open. AT time t = 0, the switch is closed. Find the values of i_1, i_2, $\frac{di_1}{dt}$ and $\frac{di_2}{dt}$ at $t = 0^+$.

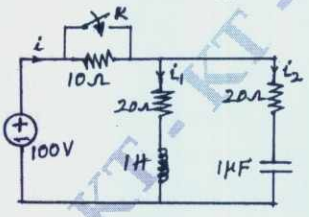

Fig Q6(a) **(10 Marks)**

b. In the network of the Fig Q6(b), the switch K is closed at t = 0 a steady state having previously excited. Draw the transform network and find the current i(t), using the Laplace transformation method.

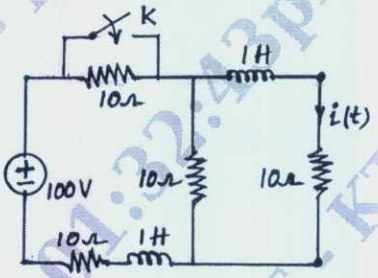

Fig Q6(b) **(10 Marks)**

Module-4

7 a. In a series resonant circuit, show that resonant frequency is equal to the geometric mean of half-power frequencies. **(06 Marks)**

b. An R-L-C series circuit of 8Ω resistance should be designed to have a bandwidth of 50Hz. Determine the values of L and C, so that the system resonates at 250Hz. Also determine the half power frequencies. **(06 Marks)**

c. For the network shown in Fig Q7(c), determine the value of C at which it resonates when f = 100Hz. Also find the values of R_L and R_C at which the circuit resonates at all frequencies.

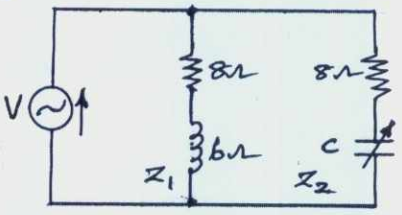

Fig Q7(c) **(08 Marks)**

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OR

8 a. Define the following terms pertaining to a series R-L-C circuit, i) Resonance ii) Quality factor iii) Bandwidth iv) Selectivity. **(04 Marks)**

b. A series R-L-C circuit with an input voltage $5\angle 0^\circ$ V resonates at a frequency of 8400Hz. The peak value of current is 500mA at resonance and the bandwidth is 120Hz. Determine the values of R, L, C and cut-off frequencies. **(06 Marks)**

c. For the network shown in Fig Q8(c), determine: i) Resonance frequency ii) Input admittance iii) Quality factor iv) Bandwidth and v) half power frequencies.

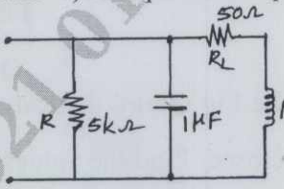

Fig Q8(c) **(10 Marks)**

Module-5

9 a. Obtain Y-parameters in terms of z-parameters. **(06 Marks)**

b. Find hybrid parameters for the two part shown in Fig Q9(b). What value of K in the two-part of figure shown will produce reciprocal network.

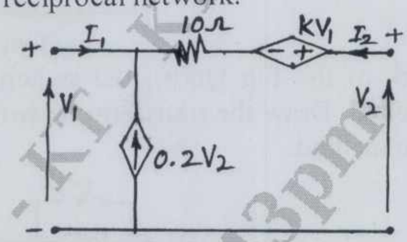

Fig Q9(b) **(06 Marks)**

c. Determine the ABCD parameters for the network of Fig Q9(c).

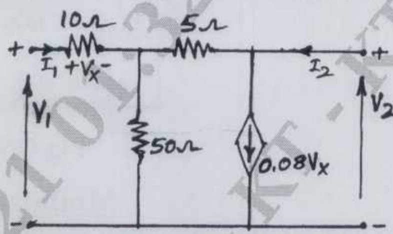

Fig Q9(c) **(08 Marks)**

OR

10 a. Explain h-parameters with equivalent circuit. Also obtain t-parameters in terms of h-parameters and hence show that AD – BC = 1. **(10 Marks)**

b. Find the Z-parameters and the Y-parameters for the network of Fig Q10(b)

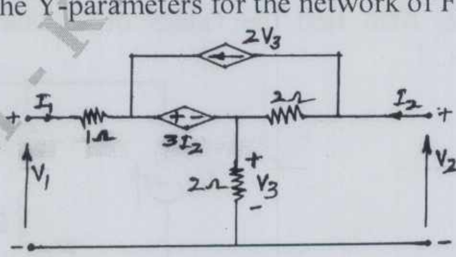

Fig Q10(b) **(10 Marks)**

* * * * *

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CBCS SCHEME

USN | | | | | | | | | | |

17EC36

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Engineering Electromagnetics

Time: 3 hrs. Max. Marks: 100

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

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.

Module-1

1 a. State and explain Coulomb's Law in vector form. **(04 Marks)**

b. Derive the expression for electric field intensity due to infinite line charge. **(08 Marks)**

c. Let a point charge $Q_1 = 25nc$ be located at A(4, –2, 7) and a charge $Q_2 = 60nc$ be at B(–3, 4, –2). Find $\vec{E}$ at C(1, 2, 3). Also find the direction of the electric field. Given $\in_0 = 8.854 \times 10^{-12} F/M$. **(08 Marks**

OR

2 a. Define electric field intensity and flux density also derive an expression for electric field intensity $\vec{E}$ at a point due to many charges. **(07 Marks)**

b. Point charges of 50nc each are located at A(1, 0, 0), B(–1, 0, 0), C(0, 1, 0) and D(0, –1, 0)m find the total force on the charge at A and also find $\vec{E}$ at A. **(08 Marks)**

c. A uniform line charge of infinite length with $P_L = 40nc/m$, lies along the Z-axis. Find $\vec{E}$ at (–2, 2, 8) in air. **(05 Marks)**

Module-2

3 a. State and prove Gauss Law for point charge. **(06 Marks)**

b. Define potential difference and absolute potential. **(04 Marks)**

c. In the given relation $D = 4xy\hat{a}_x + 2(x^2 + y^2)\hat{a}_y + 4yz\hat{a}_z \, c/m^2$. Evaluate both sides of the divergence theorem and find the charge enclosed within the rectangular parallelpiped $(0 \le x \le 2)$, $(0 \le y \le 3)$ and $(0 \le z \le 5)$m. **(10 Marks)**

OR

4 a. State and prove divergence theorem. **(04 Marks)**

b. Derive point form of continuity equation for current. **(08 Marks)**

c. A point charge of 6nc is located at origin in free space, find potential of point P, if P is located at (0.2, –0.4, 0.4) and

i) V = 0 at infinity

ii) V = 0 at (1, 0, 0)

iii) V = 20V at (–0.5, 1, –1). **(08 Marks)**

Module-3

5 a. State and prove uniqueness theorem. **(08 Marks)**

b. By applying Laplace equation find the expression for capacitance between the two concentric spheres. Make suitable assumptions. **(12 Marks)**

OR

6 a. Derive the expressions for Poisson's and Laplace's equation. **(04 Marks)**

b. State and explain Biot – Savart Law. **(06 Marks)**

c. Given the potential field $V = [Ar^4 + Br^{-4}]\sin 4\phi$:

i) Show that $\nabla^2 V = 0$

ii) Find A and B such that V = 10V and $\vec{E} = 500$V/m at P(r = 1, ϕ = 22.5°, z = 2). **(10 Marks)**

Module-4

7 a. Derive an expression for magnetic forces on :

i) Moving point charge and

ii) Differential current element. **(10 Marks)**

b. Two differential current elements,

$I_1\Delta\vec{L}_1 = 10^{-5}\,\hat{a}_2$ A.M at $P_1(1, 0, 0)$ and

$I_2\Delta\vec{L}_2 = 10^{-5}(0.6\hat{a}_x - 2\hat{a}_y + 3\hat{a}_2)$A.M at $P_2(-1, 0, 0)$

are located in free space. Find vector force exerted on $I_2\Delta\vec{L}_2 = I_1\Delta\vec{L}_1$. **(10 Marks)**

OR

8 a. Drive the magnetic boundary conditions at the interface between the two different magnetic materials. Discuss the conditions. **(10 Marks)**

b. A sq. loop carrying 2mA current is placed in the field of an infinite filament carrying current of 15Amp as shown in Fig.Q8(b). Find the force exerted on the sq loop.

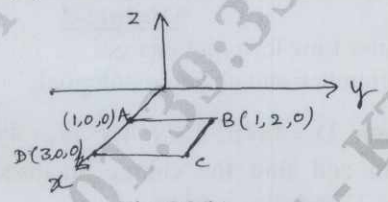

Fig.Q8(b). **(10 Marks)**

Module-5

9 a. Write a Maxwell's equations in point form and integral form. **(06 Marks)**

b. A uniform plane wave with an intensity of electric field equal to 1volt/m is travelling in free space. Find the magnitude of the associated magnetic field. **(04 Marks)**

c. State and explain pointing theorem. **(10 Marks**

OR

10 a. State and explain Faraday's Law of electromagnetic induction. **(04 Marks)**

b. Starting from Maxwell's equation obtain the general wave equations in electric magnetic fields. **(08 Marks)**

c. A UPW with 10MHz frequency has average pointing vector 1 W/m^2 if the medium is perfect dielectric with $\mu_r = 2$, and $\epsilon_r = 3$, $\mu_0 = 4\pi \times 10^{-7}$H/m, $\epsilon_0 = 8.854 \times 10^{-12}$F/m ;

Find :

i) Velocity

ii) Wavelength

iii) Intrinsic impedance

iv) rms value of electric field. **(08 Marks)**

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CBCS SCHEME

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17MATDIP31

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Additional Mathematics - I

Time: 3 hrs. Max. Marks: 100

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

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.

Module-1

1 a. Find the modulus and amplitude of $\frac{(1+i)^2}{3+i}$. **(06 Marks)**

b. If $x + \frac{1}{x} = 2\cos\alpha$, then prove that $x^n + \frac{1}{x^n} = 2\cos n\alpha$. **(07 Marks)**

c. Find the fourth roots of $1 - \sqrt{3}$ and represent them on an argand plane. **(07 Marks)**

OR

2 a. If the vectors $2\hat{i} + \lambda\hat{j} + \hat{k}$ and $4\hat{i} - 2\hat{j} - 2\hat{k}$ are perpendicular to each other than find the value of λ. **(06 Marks)**

b. Find the sine of the angle between the vectors $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} - 3\hat{j} + 2\hat{k}$. **(07 Marks)**

c. Find λ such that the vectors $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} + 2\hat{j} - 3\hat{k}$ and $3\hat{i} + \lambda\hat{j} + 5\hat{k}$ are coplanar. **(07 Marks)**

Module-2

3 a. Find the n^{th} derivative of $\cos x \cos 2x \cos 3x$. **(06 Marks)**

b. With usual notations prove that $\text{Tan}\,\phi = r\frac{d\theta}{dr}$. **(07 Marks)**

c. Prove that $\sqrt{1+\sin 2x} = 1 + x - \frac{x^2}{2} - \frac{x^3}{3} + \frac{x^4}{24} + \ldots\ldots$ By using Maclaurin's expansion. **(07 Marks)**

OR

4 a. If $u = \text{Tan}^{-1}\left(\frac{x^3 + y^3}{x - y}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$. **(06 Marks)**

b. If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$. **(07 Marks)**

c. If $u = e^x \cos y$, $v = e^x \sin y$, find $J = \frac{\partial(u, v)}{\partial(x, y)}$. **(07 Marks)**

Module-3

5 a. Evaluate $\int_0^{\pi} x\cos^6 x\,dx$. **(06 Marks)**

b. Evaluate $\int_0^1\int_0^1 \frac{dxdy}{\sqrt{(1-x^2)(1-y^2)}}$. **(07 Marks)**

c. Evaluate $\int_0^1\int_0^2\int_1^2 x^2 y z\,dx\,dy\,dz$. **(07 Marks)**

OR

6 a. Evaluate $\int \sin^6 x \, dx$. **(06 Marks)**

b. Evaluate $\iint_R (x^2 + y^2) \, dx \, dy$, where R is the triangle bounded by the lines $y = 0$, $y = x$ and $x = 1$. **(07 Marks)**

c. Evaluate $\int_0^1 \int_0^1 \int_0^1 e^{x+y+z} \, dx \, dy \, dz$. **(07 Marks)**

Module-4

7 a. A particle moves along a curve whose position vector is given by $\vec{r} = \left(t - \frac{t^3}{3}\right)\hat{i} + t^2\hat{j} + \left(t + \frac{t^3}{3}\right)\hat{k}$. Find the velocity and acceleration at $t = 3$. **(06 Marks)**

b. Find the unit normal vector to the surface $xy + x + zx = 3$ at (1, 1, 1). **(07 Marks)**

c. Find div $\vec{F}$ and curl $\vec{F}$, where $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$. **(07 Marks)**

OR

8 a. A particle moves so that its position vector is given by $\vec{r} = \cos wt \, \hat{i} + \sin wt \, \hat{j}$, where w is a constant. Show that the velocity $\vec{V}$ is perpendicular to $\vec{r}$. **(06 Marks)**

b. If $\vec{F} = (x + y + 1)\,\hat{i} + \hat{j} - (x + y)\,\hat{k}$, show that $\vec{F}$ curl $\vec{F} = 0$. **(07 Marks)**

c. Show that $\vec{f} = (\sin y + z)\,\hat{i} + (x \cos y - z)\,\hat{j} + (x-y)\,\hat{k}$ is irrotational. Also find ϕ such that $\vec{f} = \nabla\phi$. **(07 Marks)**

Module-5

9 a. Solve $\frac{dy}{dx} = 1 + \frac{y}{x} + \left(\frac{y}{x}\right)^2$. **(06 Marks)**

b. Solve $\frac{dy}{dx} + y \cot x = \sin x$. **(07 Marks)**

c. Solve $(x^2 + y)dx + (y^3 + x)\,dy = 0$. **(07 Marks)**

OR

10 a. Solve $\frac{dy}{dx} + \frac{y}{x} = y^2 x$. **(06 Marks)**

b. Solve $(y \cos x + \sin y + y)\,dx + (\sin x + x \cos y + x)\,dy = 0$. **(07 Marks)**

c. Solve $y^2 + x^2 \frac{dy}{dx} = xy \frac{dy}{dx}$. **(07 Marks)**

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CBCS SCHEME

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17CPH39/49

Third/Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Constitution of India and Professional Ethics and Human Rights
(COMMON TO ALL BRANCHES)

Time: 2 hrs.] [Max. Marks: 30

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the thirty 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. When the Indian Constitution given effect
   a) 26.10.1949 b) 26.12.1949
   c) 26.01.1950 d) 26.01.1949

2. 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

3. The President power to suspend death sentence temporarily is called
   a) Respite b) Reprieve
   c) Remission d) Constitution

4. The Preamble of the Constitution has been amended so far
   a) 4 times b) 3 times
   c) Twice d) Once

5. Which one of the following is not one of the 3 organs of the state/union?
   a) Executive b) Press
   c) Judiciary d) Legislation

6. Which one of the following states constitution has been removed by the Parliament?
   a) West Bengal b) Nagaland
   c) Sikkim d) J & K

7. Which one of the landmark judgment passed by the Supreme Court in respect of Preamble of the Constitution
   a) Beru Bari
   b) Keshavananda Bharathi
   c) Menaka Gandhi
   d) Sonia Gandhi

8. Who is the Neutral person in the affairs of the party politics?
   a) C.M.
   b) Home Minister
   c) Finance Minister
   d) Speaker

9. Indian Constitution guarantees reservation of seats to SC and ST in
   a) Loksabha and Assembly only
   b) Loksabha only
   c) Loksabha and Rajyasabha
   d) Rajyasabha

10. India is referred to as _____ under the Indian Constitution
   a) Country
   b) Hindustan
   c) India
   d) Bharat

11. Who will preside over the joint session of both the houses of the parliament
   a) President
   b) Prime Minister
   c) Speaker
   d) Law Minster

12. What is the minimum age for becoming M.P. in Rajyasabha and Loksabha
   a) 18 & 25 years
   b) 25 & 18 years
   c) 35 & 25 years
   d) 30 & 25 years

13. The citizens can enforce their Fundamental Rights before SC under Article
   a) Art 31
   b) Art 32
   c) Art 33
   d) Art 34

14. Who quoted "Child of Today is Citizen of Tomorrow"?
   a) L. Tilak
   b) Jawaharlal Nehru
   c) B.R. Ambedkar
   d) Gandhiji

15. Who quoted "Freedom is my birth right"
   a) L. Tilak
   b) Jawaharlal Nehru
   c) Sardar Patel
   d) Gandhiji

16. No person shall be punished for same offence more than once
   a) Jeopardy
   b) Double Jeopardy
   c) Ex-post facto law
   d) Testimonial compulsion

17. 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

18. Which important Human Rights is protected under Article 21
   a) Right to Equality
   b) Right to Life and Personal Liberty
   c) Right to Freedom of Speech
   d) Right to Religion

19. The Rajya Sabha is
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

20. 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

21. Article 19 provides
a) 6 freedoms
b) 7 freedoms
c) 8 freedoms
d) 5 freedoms

22. One of the salient features of our Constitution is
a) It is fully rigid
b) It is fully flexible
c) It is partly rigid and partly flexible
d) None of these

23. Who is the present Speaker of Loksabha
a) Sumithra Mahajan
b) K.S.Hegde
c) Om Birla
d) Venkiah Naidu

24. The Chief Election Commission holds office for a period of
a) 3 yrs
b) 6 yrs
c) 5 yrs
d) 6 yrs or till he attains the age of 65 years

25. The procedure for amending the Constitution is detailed under
a) Art 360
b) Art 368
c) Art 352
d) Art 301

26. Writ of Mandamus can be issued on the ground of
a) Non-performance of public duties
b) Unlawful Detention
c) Unlawful occupation of public offence
d) None of these

27. Engineering Ethics is
a) A macro ethics
b) Business Ethics
c) A preventive ethics
d) A code of scientific rules based on ethics

28. The use of Intellectual Property of others without permission is referred as
a) Cooking
b) Stealing
c) Plagiarism
d) Trimming

29. Who appoints the Lieutenant General to Delhi
a) Prime Minister
b) Home Minister
c) President
d) Vice-President

30. The final interpreter to the Indian Constitution is
a) Speaker of Loksabha
b) Parliament
c) President
d) SC

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