

Bihar Engineering University, Patna
B.Tech 3rd Semester Examination, 2025

Course: B.Tech
 Code: 103302

Subject: Analog Electronics

Time: 03 Hours
 Full Marks: 70

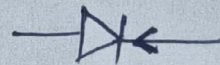
Instructions:-

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

Q.1 Choose the correct option / answer the following (Any seven questions only)

[2 x 7 = 14]

- (a) For a phase shift oscillator with equal RC sections, frequency is
- | | |
|-------------------------|-----------------------------------|
| (i) $\frac{1}{2\pi RC}$ | (iii) $\frac{1}{2\pi RC\sqrt{6}}$ |
| (ii) $\frac{1}{\pi RC}$ | (iv) $\frac{1}{RC}$ |
- (b) In a Zener regulator, maximum power dissipation occurs when
- | | |
|---------------------------------|----------------------------------|
| (i) The Load current is maximum | (ii) The Load current is minimum |
| (iii) Input voltage is minimum | (iv) Zener is off |
- (c) An 8-bit ADC with a 5V reference has a resolution
- | | |
|--------------|-------------|
| (i) 19.53 mV | (iii) 5 mV |
| (ii) 10 mV | (iv) 2.5 mV |
- (d) In BJT, high-frequency response is limited by
- | | |
|-----------------|--------------------|
| (i) Resistances | (iii) Capacitances |
| (ii) Inductance | (iv) Power |
- (e) A silicon diode at 300K carries 1 mA at 0.7V. The current at 0.8V is approximately
- | | |
|-----------|-------------|
| (i) 2 mA | (iii) 10 mA |
| (ii) 5 mA | (iv) 20 mA |
- (f) In a PN junction under forward bias, the depletion region
- | | |
|--------------|--------------------|
| (i) Widens | (iii) Remains same |
| (ii) Narrows | (iv) Breaks |
- (g) MOSFET, in saturation region
- | | |
|------------------------------|----------------------|
| (i) $V_{DS} < V_{GS} - V_T$ | (iii) $V_{GS} < V_T$ |
| (ii) $V_{DS} > V_{GS} - V_T$ | (iv) None |
- (h) In reverse bias, diode behaves like
- | | |
|-------------------|-----------------|
| (i) Short circuit | (iii) Capacitor |
| (ii) Open circuit | (iv) Inductor |
- (i) MOSFET acts as current source in
- | | |
|-------------|------------------|
| (i) Cutoff | (iii) Saturation |
| (ii) Triode | (iv) Breakdown |
- (j) In an op-amp circuit, slew rate limits
- | | |
|-------------------------|-----------------------------|
| (i) Gain | (iii) Rate of output change |
| (ii) Frequency response | (iv) Offset |



Q2 (a) (b)

- (a) Explain the current mirror circuit and its applications.
- (b) Explain the instrumentation amplifier and its advantages.

[7]
 [7]

- Q.3 (a) Explain the working of a bridge rectifier with waveform diagrams. [7]
(b) Design a square-wave generator using an op-amp and explain its operation. [7]
- Q.4 (a) Explain the small-signal model of MOSFET. [7]
(b) Derive the expression for the voltage gain of a non-inverting amplifier. [7]
- Q.5 (a) Calculate the input and output impedance of a CE BJT amplifier. [7]
(b) Evaluate the limitations of differential amplifiers in practical applications. [7]
- Q.6 (a) Describe the basic working principle of a differential amplifier. [7]
(b) Explain the structure and operation of MOSFET. [7]
- Q.7 (a) Design a PI controller using an op-amp and explain its advantage over P controller. [7]
(b) Explain the operation of a clipping circuit and design a positive clipper. [7]
- Q.8 (a) Derive expressions for upper and lower threshold voltages in a Schmitt trigger by taking a suitable circuit diagram. [7]
(b) Examine the impact of input bias current on op-amp circuits. [7]
- Q.9 Write short notes on *any two* of the following: [7 x 2 = 14]
(a) Hybrid- π model of BJT
(b) Waveform shaping circuits using op-amp
(c) Need for filters in rectifier circuits
(d) Miller's theorem

Bihar Engineering University, Patna

B.Tech 3rd Semester Examination, 2025

Course: B.Tech
Code: 103303

Subject: Electrical Machine-I

Time: 03 Hours
Full Marks: 70

Instructions:-

- (i) The marks are indicated in the right-hand margin.
- (ii) There are NINE questions in this paper.
- (iii) Attempt FIVE questions in all.
- (iv) Question No. 1 is compulsory.

Q.1 Choose the correct option / answer the following (Any seven question only):

[2 x 7 = 14]

- (a) Energy stored by a coil is doubled when its current is increased by percent
 - (i) 25
 - (ii) 100
 - (iii) 50
 - (iv) 41.4
- (b) A 4 KVA, 400/200V, 1-phase transformer has leakage impedance of $0.02 + j0.04$ per unit. This leakage impedance in ohms, when referred to h.v. side is
 - (i) $0.8 + j 1.6 \Omega$
 - (ii) $0.08 + j 0.16 \Omega$
 - (iii) $0.2 + j 0.4 \Omega$
 - (iv) $1 + j 2 \Omega$
- (c) A transformer secondary is connected to pure resistive load. The power factor on the primary side will be
 - (i) near about 0.95 lead
 - (ii) zero
 - (iii) near about 0.95 lag
 - (iv) unity
- (d) Full-load voltage regulation of a power transformer is zero when power factor of the load is near
 - (i) unity and leading
 - (ii) zero and lagging
 - (iii) zero and leading
 - (iv) unity and lagging
- (e) A 10 KVA step down auto transformer has voltage ratio of 0.7. The transformed and conducted kVA can be respectively
 - (i) 3, 7
 - (ii) 5, 5
 - (iii) 7, 3
 - (iv) 3.5 and 6.5
- (f) The energy stored in the magnetic field of a solenoid 30 cm long and 3 cm diameter wound with 1000 turns of wire carrying a current of 10 A is
 - (i) 0.015 joule
 - (ii) 0.5 joule
 - (iii) 0.15 joule
 - (iv) 1.15 joule
- (g) The commutator segments of DC machines are made up of
 - (i) brass
 - (ii) hard-drawn copper
 - (iii) copper
 - (iv) copper alloy
- (h) A DC shunt generator builds up 230 V when driven in clockwise direction. In case it is driven in anticlockwise direction, other things remaining unchanged, then the voltage build up is
 - (i) 230 V
 - (ii) somewhat more than 230 V
 - (iii) somewhat less than 230 V
 - (iv) not possible
- (i) A 220 V DC machine has an armature resistance of 1Ω . If the full-load current is 20 A, the difference in the induced voltages when the machine is running as a motor and as a generator is
 - (i) 20 V
 - (ii) 40 V
 - (iii) zero
 - (iv) 50 V

- (j) The flux is maximum in the following parts of a DC motor
- | | |
|-----------------------------|------------------------------|
| (i) pole core | (iii) under the inter pole |
| (ii) under leading pole tip | (iv) under trailing pole tip |
- Q.2** (a) Explain the concept of magnetic circuits. Derive the expression for reluctance and compare it with electrical resistance. [7]
- (b) Explain B-H curve and hysteresis loop. Derive the expression for hysteresis loss. [7]
- Q.3** (a) Derive the equivalent circuit of a transformer and explain parameter determination using OC and SC tests. [7]
- (b) A 50 kVA, 2200/110 V transformer when tested gave the following results: [7]
 OC test, measurements on the LV side: 400 W, 10 A, 110 V
 SC test, measurements on the HV side: 808 W, 20.5 A, 90 V
 Compute all the parameters of the equivalent circuit referred to the HV and LV sides of the transformer. Also calculate % voltage regulation and efficiency at full load and 0.8 pf lagging.
- Q.4** (a) Define voltage regulation and efficiency of a transformer. Derive expressions and explain the condition for maximum efficiency. [7]
- (b) Explain the Sumpner (back-to-back) test and its advantages over direct loading test. [7]
- Q.5** (a) Explain Scott connection with phasor diagram and its applications. [7]
- (b) A 20 kVA, 2000/200 V, two-winding transformer, is to be used as an auto transformer with a constant source voltage of 2000 V. At full load of unity power factor, calculate the power output, power transformed and power conducted. If the efficiency of the efficiency of the two-winding transformer at 0.7 pf is 97%, find the efficiency of the autotransformer. [7]
- Q.6** (a) Derive the expression for torque in singly excited and doubly excited systems. [7]
- (b) Derive the EMF equation and torque equation of a DC machine. Explain armature reaction and methods to reduce its effects. [7]
- Q.7** (a) Explain the characteristics of DC generators and the concept of voltage build-up. [7]
- (b) A DC shunt motor is being operated from 300 V mains. Its no-load speed is 1200 rpm. When fully loaded, it delivers a torque of 400 Nm and its speed drops to 1100 rpm. Find its speed and power output when delivering the same torque; if operated with an armature voltage of 600 V. Excitation is assumed unchanged, i.e. the motor field is still excited at 300 V. State any assumption you are required to make. [7]
- Q.8** (a) Explain various methods of speed control of DC motors. [7]
- (b) A lap-wound DC shunt generator having 80 slots with 10 conductors per slot generates at no load and e.m.f. of 400 V when running at 1000 r.p.m. At what speed should it be rotated to generate a voltage of 220 V on open circuit. [7]
- Q.9** Write short note on *any two* of the following: [7 x 2 = 14]
- | |
|---|
| (a) EMF equation of a single-phase transformer |
| (b) Parallel operation of transformers and load sharing |
| (c) Commutation in DC machine |
| (d) Braking methods of DC motors |

Bihar Engineering University, Patna
B.Tech 3rd Semester Examination, 2025

Course: B.Tech
Code: 103304

Subject: Engineering Mathematics-III (PDF, Prob/Stat)

Time: 03 Hours
Full Marks: 70

Instructions:-

- (i) The marks are indicated in the right-hand margin.
- (ii) There are NINE questions in this paper.
- (iii) Attempt FIVE questions in all.
- (iv) Question No. 1 is compulsory.

Q.1 Choose the correct option / answer the following (Any seven question only):

[2 x 7 = 14]

- (a) Which of the function is hyperbolic
- (i) Laplace equation
 - (ii) Wave equation
 - (iii) Heat equation
 - (iv) None of those
- (b) In $y = ax + b$, $\sum x = 50$, $\sum y = 80$, $\sum xy = 1030$, $\sum x^2 = 750$ and $n = 10$ then $a = ?$
- (i) 1.26
 - (ii) 1.69
 - (iii) 2.1
 - (iv) None of those
- (c) If non-linear partial differential equations is in form $f(p, q) = 0$, then its complete solution while be (where c & a are arbitrary constants)
- (i) $z = px + qy + c$
 - (ii) $z = py + qx + c$
 - (iii) $z = ax + by + c$
 - (iv) $z = ax + f(a)y + c$
- (d) Solve the PDE $4r + 12s + 9t = 0$
- (i) $z = f(2x - 3y) + xg(2y - 3x)$
 - (ii) $z = f(2y - 3x) + xg(2y - 3x)$
 - (iii) $z = f(2x - 3y) + g(2y - 3x)$
 - (iv) None of these
- (e) The probability density function of a random variable x is
- $$f(x) = \begin{cases} \frac{1}{4}(2 - x^2) & \text{for } 0 \leq x \leq 2 \\ 0 & \text{otherwise} \end{cases}$$
- The mean of the random variable is
- (i) -1/3
 - (ii) 1/4
 - (iii) 0
 - (iv) None of these
- (f) Let $f(x)$ be the continuous probability density function of a random variable X . The probability that $a < X \leq b$, is
- (i) $\int_a^b xf(x) dx$
 - (ii) $\int_a^b f(x) dx$
 - (iii) $f(b) - f(a)$
 - (iv) $f(b - a)$
- (g) One sample of 13 bulbs gives a standard deviation of 6 hours of the life and another sample of 16 bulbs gives a standard deviation of 8 hours of the life. Find $F =$
- (i) 0.66
 - (ii) 0.56
 - (iii) 1.78
 - (iv) None of these
- (h) Find partial differential equation of the given equation :
- $$z = f(x + ay) + g(x - ay)$$
- (i) $r = a^2s$
 - (ii) $t = a^2r$
 - (iii) $r = a^2t$
 - (iv) $s = a^2r$
- (i) If the probability that a new-born child is a male is 0.6, find the probability that in a family of 5 children there are exactly 3 boys
- (i) 0.3456
 - (ii) 0.2345
 - (iii) 0.4567
 - (iv) 0.2468
- (j) Null hypothesis is in terms of
- (i) Constant
 - (ii) Sample
 - (iii) Statistic
 - (iv) Parameter



- Q.2 (a) Solve $(3x + y - z)p + (x + y - z)q = 2(z - y)$. [7]
 (b) Discuss the mean derivation and standard deviation of the following marks distribution: [7]

Statistics	25	50	45	30	70	42	36	38	34	60
Mathematics	70	10	20	50	55	42	95	63	22	45

- Q.3 (a) There is a consignment of 10000 balls whose max. and min. possible values are desired to be fixed on the basis of the following results: "A sample of 100 balls is taken at random and observed that 40 balls are of the top quality of grade I worth Rs. 5/- each, 25 are of grade II worth Rs. 4/- each and the remaining are of grade III worth Rs.3/- each. [7]

- (b) A card was drawn from a pack of cards, was noted and then replaced and the pack shuffled. This was repeated ten times and the number of black suit cards was noted. A thousand results were obtained in this way and given below. The number of black cards denote by x . (χ^2 of 10 d.f. is 18.360 and 9 d.f is 16.919). [7]

x	0	1	2	3	4	5	6	7	8	9	10
f	3	10	43	110	210	243	205	115	39	14	8

- Q.4 (a) Supposing the life in hour of a certain kind of radio tube has the density $f(x) = \begin{cases} 100/x^2 & \text{for } x \geq 100 \\ 0 & \text{elsewhere} \end{cases}$. What the probability that [7]
 (i) None of three such tubes in a is given radio set will have to be replaced during the first 150 hours of operation?
 (ii) All the three original tubes have been replaced during the first 150 hours.
 (b) A certain screw making machine produces on average of 2 defective screws out of 100 and packs them in boxes of 500. Find the probability that a box contains 7 and 15 defective screws. [7]

- Q.5 (a) Solve $\frac{\partial^2 z}{\partial t^2} = c^2 \frac{\partial^2 z}{\partial x^2}$ by D'Alembert's method where $z(0, t) = z(\pi, 0) = 0$, $z(x, 0) = 0$ and $\left(\frac{\partial z}{\partial t}\right)_{t=0} = \frac{(\pi x - x^2)}{100}$. [7]
 (b) Solve $(4D^2 - 12DD' + 29)z = e^{3x-2y}$. [7]

- Q.6 (a) Solve $(4D^2 - 4DD' + D'^2)z = 16 \log(2x + y)$. [7]
 (b) It is known that the reading for x and y given below should follow a law of the form $y = a + bx$, where a and b are constants [7]

$x :$	1	2	3	4	5	6	7	8
$y :$	5.4	6.3	8.2	10.3	12.6	14.7	17.3	19.5

- Q.7 (a) Solve $\frac{\partial z}{\partial x} = 2 \frac{\partial z}{\partial y} + z$, $z(x, 0) = 6e^{-3x}$ by using separation of variables. [7]
 (b) An insulated rod of length l has its ends A and B kept at a° Celsius and b° Celsius respectively until steady state conditions prevail. The temperature at each end is suddenly reduced to zero degree Celsius and kept so. Find the resulting temperature at any point of the rod taking the end A as origin. [7]

- Q.8 (a) Prove that Poisson distribution as a limiting case of Binomial distribution. [7]
 (b) An urn contains 1000 white and 2000 black balls. We draw (with replacement) 300 balls. Estimate the probability that the number of while balls among 300 drawn balls lies between 80 and 120. Also find this value by Chebyshev's inequality. ($\Phi(\sqrt{6}) = 0.9929$) [7]

- Q.9 Write short note on **any two** of the following: [7 x 2 = 14]

- (a) Duhamel's Principle
 (b) Non-linear partial differential equation
 (c) Test of significance
 (d) Multinomial distribution

Bihar Engineering University, Patna

B.Tech 3rd Semester Examination, 2025

Course: B.Tech
Code: 103305

Subject: Engineering Mechanics

Time: 03 Hours
Full Marks: 70

Instructions:-

- (i) The marks are indicated in the right-hand margin.
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- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

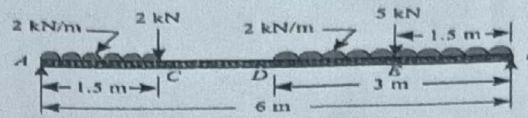
Q.1 Choose the correct option / answer the following (Any seven question only):

[2 x 7 = 14]

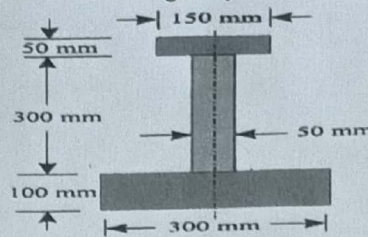
- (a) Acceleration is
 - (i) Scalar
 - (ii) Vector
 - (iii) Constant
 - (iv) None
- (b) A system of forces whose lines of action lie in one plane is called
 - (i) Non-coplanar
 - (ii) Coplanar
 - (iii) Parallel
 - (iv) Concurrent
- (c) Resultant of parallel forces is
 - (i) Zero
 - (ii) Single force
 - (iii) Couple only
 - (iv) None
- (d) Zero force members are
 - (i) Carry load
 - (ii) Do not carry load
 - (iii) Broken members
 - (iv) None
- (e) Compression members are also called
 - (i) Ties
 - (ii) Struts
 - (iii) Beams
 - (iv) Frames
- (f) Moment of inertia is
 - (i) Resistance to motion
 - (ii) Resistance to rotation
 - (iii) Force
 - (iv) Energy
- (g) MOI of circle about centroidal axis is
 - (i) πr^2
 - (ii) $\pi r^4/4$
 - (iii) $\pi r^4/64$
 - (iv) πr^3
- (h) Degrees of freedom means
 - (i) No. of forces
 - (ii) No. of independent motions
 - (iii) Velocity
 - (iv) Energy
- (i) ~~D~~ Alembert's principle converts dynamic problem into
 - (i) Static
 - (ii) Kinetic
 - (iii) Energy
 - (iv) None
- (j) Impulse is
 - (i) Force \times time
 - (ii) Force \times distance
 - (iii) Mass \times velocity
 - (iv) None



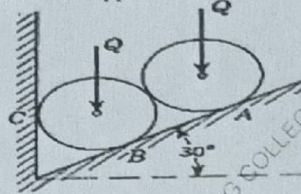
- Q.2 (a) Define scalar and vector quantities. Explain different types of vectors (unit vector, position vector, equal vectors, etc.) and perform vector addition using analytical method. [7]
- (b) A simply supported beam AB of span 6 m is loaded as shown in Fig.5. Determine the reactions at A and B. [7]



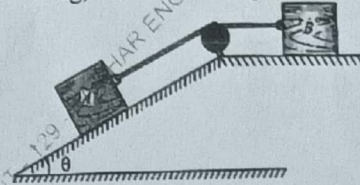
- Q.3 (a) An I-section as shown in Fig. has the following dimensions in mm units: Bottom flange = 300×100 Top flange = 150×50 Web = 300×50 Determine mathematically the position of center of gravity of the section. [7]



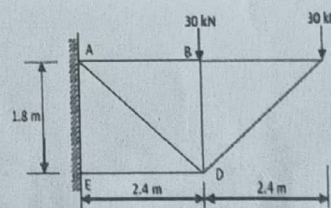
- (b) Two identical rollers, each of weight 100 N, are supported by an inclined plane and a vertical wall as shown in below Figure. Assuming smooth surfaces, find the reactions induced at the points of support A, B and C. [7]



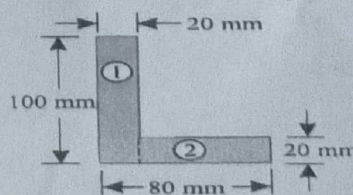
- Q.4 (a) Find the value of ' θ ' if the block 'A' and 'B' shown in Fig. have impending motion. Given block A = 20 kg, block B = 20 kg, $\mu_A = \mu_B = 0.25$. [7]



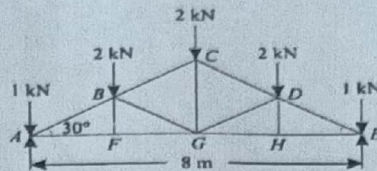
- (b) Find the forces in the members of a truss as shown in fig. [7]



- Q.5 (a) Define the following terms [7]
- (a) Parallel Axis Theorem (b) Perpendicular Axis Theorem (c) Moment of Inertia [7]
- (b) Find the moment of inertia about the centroidal X-X and Y-Y axes of the angle section shown in Fig. [7]



- Q.6 (a) A king post truss of 8 m span is loaded as shown in Fig. Find the forces in each member of the truss and tabulate the results. [7]

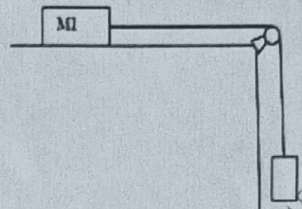


- (b) State and Prove Lami's theorem. [7]

- Q.7 (a) A car has an initial speed of 25m/s and a constant deceleration of 3m/s^2 . Determine the velocity of the car when $t=4\text{s}$. What is the displacement of the car during the 4s time interval? How much time is needed to stop the car? [7]

- (b) A projectile is fired with an initial velocity of 250m/s at a target located at a horizontal distance of 4km and vertical distance of 700 m above the gun. Determine the value of firing angle to hit the target. Neglect air resistance. [7]

- Q.8 (a) Two blocks of masses M_1 and M_2 are connected by a string as shown in Figure.7 below. Assuming the coefficient of friction between block M_1 and the horizontal surface to be μ if the system is released from rest, find the velocity of the block A after it has moved a distance of 1 m. Assume $M_1=100\text{kg}$ and $M_2=150\text{kg}$ and $\mu=0.20$. [7]



- (b) State and derive the Work-Energy Principle for rigid bodies. [7]

- Q.9 Write short note on *any two* of the following: [7 x 2 = 14]

- Define the following: (i) Limiting Force of Friction (ii) Kinetic Friction (iii) Coefficient of Friction (iv) Angle of Friction
- What is a force? Give classifications of system of forces
- State and explain D'Alembert's Principle
- Explain the scope and importance of Engineering Mechanics. Differentiate between statics and dynamics with suitable examples

Bihar Engineering University, Patna

B.Tech 3rd Semester Examination, 2025

Course: B.Tech
Code: 103301

Subject: Electrical Circuit Analysis

Time: 03 Hours
Full Marks: 70

Instructions:-

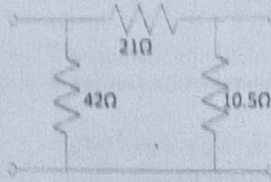
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- Attempt **FIVE** questions in all.
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Q.1 Choose the correct option / answer the following (Any seven questions only)

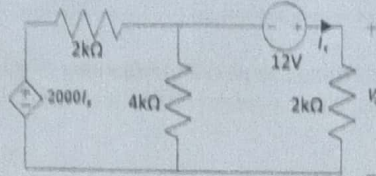
[2 x 7 = 14]

- (a) Three parallel voltage sources $10V/2\Omega$, $20V/4\Omega$, $30V/6\Omega$. Equivalent voltage (Millman)
- | | |
|-----------|--------------|
| (i) 10 V | (iii) 23.3 V |
| (ii) 20 V | (iv) 30 V |
- (b) Voltage across the capacitor after four time constants is approximately
- | | |
|------------------------------|-------------|
| (i) 36.8% of the final value | (iii) 63.2% |
| (ii) 50% | (iv) 98% |
- (c) A graph has 6 nodes and 9 branches. Number of twigs in a tree
- | | |
|--------|---------|
| (i) 5 | (iii) 6 |
| (ii) 8 | (iv) 9 |
- (d) While applying superposition theorem, voltage sources are replaced by
- | | |
|--------------------|------------------|
| (i) Open circuit | (iii) Resistance |
| (ii) Short circuit | (iv) Inductance |
- (e) Millman's theorem is mainly used for
- | | |
|-------------------------------|--------------------------|
| (i) Series circuits | (iii) Transient analysis |
| (ii) Parallel voltage sources | (iv) Resonance |
- (f) Energy stored in capacitor $C = 2\mu F$, $V = 10V$
- | | |
|-----------------|------------------|
| (i) $50\mu J$ | (iii) $200\mu J$ |
| (ii) $100\mu J$ | (iv) $20\mu J$ |
- (g) Which of the following is an active element?
- | | |
|----------------|---------------------|
| (i) Resistor | (iii) Inductor |
| (ii) Capacitor | (iv) Voltage source |
- (h) Laplace transform of $\sin(2t)$ is
- | | |
|--------------------|---------------------|
| (i) $2/(s^2 + 4)$ | (iii) $s/(s^2 + 4)$ |
| (ii) $1/(s^2 - 4)$ | (iv) $1/(s^2 - 4)$ |
- (i) Which of the following is a linear circuit element?
- | | |
|-----------------|----------------|
| (i) Diode | (iii) Resistor |
| (ii) Transistor | (iv) SCR |
- (j) Open circuit condition in two-port means
- | | |
|------------------|---------------------|
| (i) Current = 0 | (iii) Power = 0 |
| (ii) Voltage = 0 | (iv) Resistance = 0 |

- Q.2 (a) Find the inverse Laplace transform of $F(s) = \frac{12(s+1)(s+3)}{s(s+2)(s+4)(s+5)}$ [7]
 (b) Find the Y-parameter for the two-port network as shown below [7]

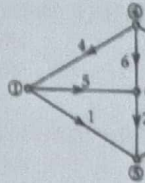


- Q.3 (a) Use mesh analysis to find V_0 [7]

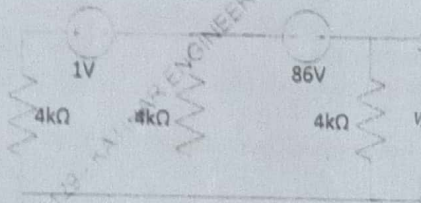


- (b) Derive the expression of the resonance frequency and Q-factor for the series-connected RLC circuit. Also, draw the phasor for voltages across R, L, & C and the nature of the circuit below, above & at the resonance frequency. [7]

- Q.4 (a) Obtain the fundamental loop and fundamental cut-set matrices for the graph shown below [7]

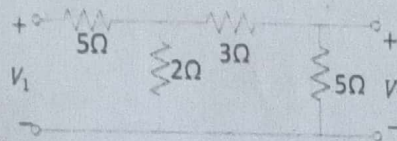


- (b) Find V_0 in the circuit shown below [7]

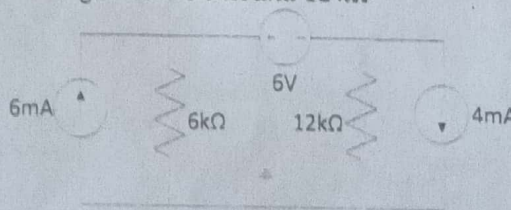


- Q.5 (a) Solve the differential equation using the Laplace transform $\frac{d^2y(t)}{dt^2} + \frac{4dy(t)}{dt} + 4y(t) = u(t)$, $y(0) = 0$, $y'(0) = 1$. [7]

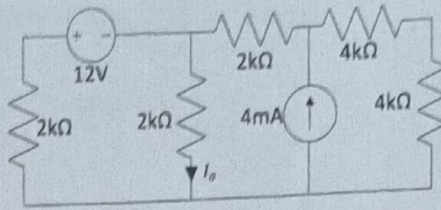
- (b) Find the Z-parameter of the circuit shown below [7]



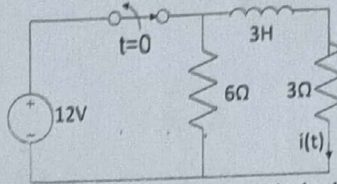
- Q.6 (a) Explain the concept of poles and zeros and their effect on system stability. [7]
 (b) Find the current through resistors $6k\Omega$ and $12k\Omega$ [7]



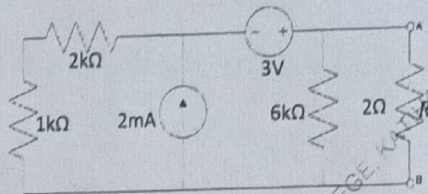
- Q.7 (a) Define and explain different types of circuit elements. Classify them into linear/non-linear, active/passive, and unilateral/bilateral devices with suitable examples. [7]
- (b) Use Norton's theorem to find I_o . [7]



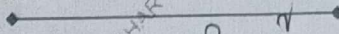
- Q.8 (a) In the network shown below, the switch is opens at $t = 0$. Use Laplace transforms to find $i(t)$ for $t > 0$. [7]



- (b) Using Thevenin's theorem, find the current through the load R_L . [7]



- Q.9 Write short notes on **any two** of the following: [7 x 2 = 14]
- Define graph, tree, twig, and link with suitable example
 - Explain Thevenin's & Reciprocity theorem
 - Properties of Laplace transforms
 - transmission parameters



Handwritten calculations for Q.8(b) using Thevenin's theorem:

$$V_B = \frac{3V \cdot 6k\Omega}{6k\Omega + 2k\Omega} = \frac{18}{8} = 2.25V$$

$$I_{sc} = \frac{2mA \cdot 6k\Omega}{6k\Omega + 2k\Omega} = \frac{12}{8} = 1.5mA$$

$$R_{th} = \frac{6k\Omega \cdot 2k\Omega}{6k\Omega + 2k\Omega} = \frac{12}{8} = 1.5k\Omega$$

$$I_{R_L} = \frac{V_B}{R_{th} + R_L} = \frac{2.25V}{1.5k\Omega + 2\Omega} \approx 1.5mA$$

Other scribbles include: $V_B = \frac{3V \cdot 60}{60+20} = \frac{180}{80} = 2.25V$, $I_{sc} = \frac{2 \cdot 60}{60+20} = \frac{120}{80} = 1.5mA$, $R_{th} = \frac{60 \cdot 20}{60+20} = \frac{1200}{80} = 1500\Omega = 1.5k\Omega$, $I_{R_L} = \frac{2.25}{1500+2} \approx 1.5mA$.

Bihar Engineering University, Patna

B.Tech 3rd Semester Examination, 2025

Course: B.Tech
Code: 103306

Subject: Universal Human Values

Time: 03 Hours
Full Marks: 70

Instructions:-

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

Q.1 Choose the correct option / answer the following (Any seven question only):

[2 x 7 = 14]

- (a) The concept of holistic development includes
 - (i) Only intellectual development
 - (ii) Development of body, mind, and values
 - (iii) Only physical growth
 - (iv) Only economic growth
- (b) According to value education, the basic human aspiration is
 - (i) Wealth and power
 - (ii) Continuous happiness and prosperity
 - (iii) Fame and recognition
 - (iv) Technological advancement
- (c) The body is considered an instrument of the Self because
 - (i) It works independently
 - (ii) It follows the instructions of the Self
 - (iii) It controls the Self
 - (iv) It controls the Self
- (d) Which practice best ensures harmony between the Self and the body?
 - (i) Overworking the body
 - (ii) Balanced lifestyle with right understanding and physical care
 - (iii) Ignoring emotional needs
 - (iv) Focusing only on material success
- (e) Which action best supports harmony in existence?
 - (i) Excessive consumption
 - (ii) Sustainable use of resources
 - (iii) Ignoring environmental balance
 - (iv) Industrial overexpansion
- (f) Which of the following best represents a universal human order?
 - (i) Competition and conflict
 - (ii) Harmony at all levels of existence
 - (iii) Isolation of individuals
 - (iv) Focus only on economic growth
- (g) Which of the following best represents a value-based production system?
 - (i) Maximizing output regardless of impact
 - (ii) Ensuring quality, sustainability, and worker well-being
 - (iii) Reducing costs by exploiting labour
 - (iv) Ignoring environmental consequences
- (h) Which strategy is most effective for transitioning towards a value-based professional life?
 - (i) Ignoring ethical concerns for success
 - (ii) Following trends blindly
 - (iii) Continuous self-reflection and alignment with human values
 - (iv) Prioritizing short-term gains
- (i) A humanistic constitution primarily aims to
 - (i) Promote economic growth only
 - (ii) Ensure justice, equality, and human values in society
 - (iii) Encourage political dominance
 - (iv) Focus solely on legal punishment



- (j) Which example best illustrates self-regulation in nature?
- | | |
|--|------------------------------------|
| (i) Industrial pollution increasing | (iii) Overuse of natural resources |
| (ii) Forest ecosystem maintaining balance of oxygen and carbon dioxide | (iv) Urban expansion |

Q.2 (a) Describe the importance of relationships in human life. How do they contribute to harmony? [7]

(b) Describe the process of self-exploration. Why is it important in value education? [7]

Q.3 (a) Explain the methods to fulfill basic human aspirations with suitable examples. [7]

(b) What is meant by right understanding? How does it influence relationships and physical facilities? [7]

Q.4 (a) Explain the concept of the human being as the co-existence of the Self and the body with suitable examples. [7]

(b) Discuss how the body acts as an instrument of the Self. Illustrate with real-life examples. [7]

Q.5 (a) Explain the concept of family as the basic unit of human interaction. How does it contribute to harmony in society? [7]

(b) Describe the vision for a universal human order. Suggest practical steps to achieve harmony at family, societal, and global levels. [7]

Q.6 (a) Explain the concept of interconnectedness among the four orders of nature. Illustrate with suitable examples how this interconnectedness contributes to harmony. [7]

(b) "Existence is co-existence." Analyze this statement in the context of the four orders of nature and evaluate its significance for sustainable living. [7]

Q.7 (a) Discuss the definitiveness of ethical human conduct. Analyze how clarity in values leads to consistency in behavior. [7]

(b) Explain the concept of natural acceptance of human values. How does it guide individuals in making ethical decisions in daily and professional life? [7]

Q.8 (a) Describe the concept of a humanistic constitution. Analyze how it can contribute to a just and equitable society. [7]

(b) Propose a framework or set of practices that individuals and societies can adopt to ensure holistic harmony in existence. Justify your suggestions with reasoning. [7]

Q.9 Write short note on *any two* of the following: [7 x 2 = 14]

(a) Relationships in human life

(b) Harmony in the Self

(c) Professional Ethics

(d) Happiness

