CBCS SCHEME

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

17MAT41

Fourth Semester B.E. Degree Examination, June/July 2019
Engineering Mathematics - IV

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. If $y' + y + 2x = 0$, $y(0) = -1$ then find $y(0.1)$ by using Taylor's series method. Consider upto third order derivative term. **(06 Marks)**

b. Find $y(0.2)$ by using modified Euler's method, given that $y' = x + y$, $y(0) = 1$. Take $h = 0.1$ and carry out two modifications at each step. **(07 Marks)**

c. If $y' = \frac{1}{x+y}$, $y(0) = 2$, $y(0.2) = 2.0933$, $y(0.4) = 2.1755$, $y(0.6) = 2.2493$ then find $y(0.8)$ by Milne's method. **(07 Marks)**

OR

2 a. Use Taylor's series method to find $y(0.1)$ from $y' = 3x + y^2$, $y(0) = 1$. Consider upto fourth derivative term. **(06 Marks)**

b. Use Runge – Kutta method to find $y(0.1)$ from $y' = x^2 + y$, $y(0) = -1$. **(07 Marks)**

c. Use Adam – Bashforth method to find $y(0.4)$ from $y' = \frac{1}{2}xy$, $y(0) = 1$, $y(0.1) = 1.0025$, $y(0.2) = 1.0101$, $y(0.3) = 1.0228$. **(07 Marks)**

Module-2

3 a. Express $x^3 - 5x^2 + 6x + 1$ in terms of Legendre polynomials. **(06 Marks)**

b. Find $y(0.1)$, by using Runge – Kutta method , given that $y'' + xy' + y = 0$, $y(0) = 1$, $y'(0) = 0$. **(07 Marks)**

c. Solve Bessel's operation leading to $J_n(x)$. **(07 Marks)**

OR

4 a. Prove that $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \sin x$. **(06 Marks)**

b. Find $y(0.4)$ by using Milne's method, given that $y(0) = 1$, $y'(0) = 1$, $y(0.1) = 1.0998$, $y'(0.1) = 0.9946$, $y(0.2) = 1.1987$, $y'(0.2) = 0.9773$, $y(0.3) = 1.2955$, $y'(0.3) = 0.946$. **(07 Marks)**

c. State and prove Rodrigue's formula. **(07 Marks)**

Module-3

5 a. Derive Cauchy – Riemann equations in Cartesian coordinates. **(06 Marks)**

b. Find an analytic function $f(z) = u + iv$ in terms of z , given that $u = e^{2x}(x \cos 2y - y \sin 2y)$. **(07 Marks)**

c. Evaluate $\int_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$, c is $|z| = 3$ by residue theorem. **(07 Marks)**

OR

6 a. Prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$. **(06 Marks)**

b. Discuss the transformation $W = Z^2$. **(07 Marks)**

c. Find a bilinear transformation that maps the points ∞ , i , o in Z – plane into -1 , -i , 1 in W – plane respectively. **(07 Marks)**

Module-4

7 a. In a sampling a large number of parts manufactured by a machine, the mean number of defectives in a sample of 20 is 2, out of 1000 such samples , how many would be expected to contain atleast 3 defective parts? **(06 Marks)**

b. If X is a normal variate with mean 30 and standard deviation 5, find the probabilities that
i) $26 \le X \le 40$ ii) $X > 45$ iii) $|X - 30| > 5$.
Given that $\phi(0.8) = 0.288$, $\phi(2.0) = 0.4772$, $\phi(3) = 0.4987$, $\phi(1) = 0.3413$. **(07 Marks)**

c. The joint density function of two continuous random variables X and Y is given by

$$f(x, y) = \begin{cases} K\,xy, & 0 \le x \le 4, \quad 1 < y < 5 \\ 0, & \text{otherwise} \end{cases}$$

Find i) K ii) E(x) iii) E(2x + 3y). **(07 Marks)**

OR

8 a. Derive mean and standard deviation of the Poisson distribution. **(06 Marks)**

b. The joint probability distribution for two random variables X and Y as follows :

X \ Y	-2	-1	4	5
1	0.1	0.2	0	0.3
2	0.2	0.1	0.3	0

Find i) Expectations of X, Y , XY ii) SD of X and Y iii) Covariance of X, Y iv) Correlation of X and Y. **(07 Marks)**

c. In a certain town the duration of shower has mean 5 minutes. What is the probability that shower will last for i) 10 minutes or more ii) Less than 10 minutes iii) Between 10 and 12 minutes. **(07 Marks)**

Module-5

9 a. A group of boys and girls were given in Intelligence test. The mean score , SD score and numbers in each group are as follows : **(06 Marks)**

	Boys	Girls
Mean	74	70
SD	8	10
X	12	10

Is the difference between the means of the two groups significant at 5% level of significance? Given that $t_{0.05} = 2.086$ for 20 d.f.

b. The following table gives the number of accidents that take place in an industry during various days of the week. Test if accidents are uniformly distributed over the week.

Day	Mon	Tue	Wed	Thu	Fri	Sat
No. of accidents	14	18	12	11	15	14

Given that $X^2 = 11.09$ at 5% level for 5 d.f. **(07 Marks)**

c. Find the unique fixed probability vector for the regular stochastic matrix.

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 1/6 & 1/2 & 1/3 \\ 0 & 2/3 & 1/3 \end{bmatrix}$$ **(07 Marks)**

OR

10 a. Define the following terms :
i) Type I error and type II error.
ii) Transient state.
iii) Absorbing state. **(06 Marks)**

b. A certain stimulus administered to each of the 12 patients resulted in the following increases of blood pressure : 5, 2, 8, -1, 3, 0, -2, 1, 5, 0, 4, 6. Can it be concluded that the stimulus will be general be accompanied by an increase in blood pressure. Given that $t_{0.05} = 2.2$ for 11 d.f. **(07 Marks)**

c. If $P = \begin{bmatrix} 0 & 2/3 & 1/3 \\ 1/2 & 0 & 1/2 \\ 1/2 & 1/2 & 0 \end{bmatrix}$. Find the corresponding stationary probability vector. **(07 Marks)**

* * * * *

CBCS SCHEME

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

17EE42

Fourth Semester B.E. Degree Examination, June/July 2019
Power Generation and Economics

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Discuss the utility of hydrograph, flow duration curve and mass curve for the power plants. **(06 Marks)**

b. Explain with neat sketch the working of hydroelectric power plant station and explain the function of each component in it. **(10 Marks)**

c. Describe different turbines and their use in hydroelectric plants. **(04 Marks)**

OR

2 a. What are the main considerations for selection of site for a hydroelectric power station? **(06 Marks)**

b. Explain the governing mechanism of water turbine, with neat sketch. **(06 Marks)**

c. How the Hydro plants are classified? Explain in detail. **(08 Marks)**

Module-2

3 a. A thermal station has an overall efficiency of 21% and 0.75 kg of coal is burnt per kWh of generated energy. Determine the calorific value of coal. **(04 Marks)**

b. Draw the schematic diagram of modern steam power station and explain its operation with its important components. **(10 Marks)**

c. Write short notes on :
(i) Electrostatic precipitator
(ii) Underfeed stokers. **(06 Marks)**

OR

4 a. Discuss in brief the methods of improving thermal efficiency of gas turbine power plants. **(09 Marks)**

b. Disouss the advantages and disadvantages of a diesel power plant. **(04 Marks)**

c. Draw a layout of Diesel power plant. Showing the various systems, including cooling, lubrication, starting, intake and exhaust systems. **(07 Marks)**

Module-3

5 a. Explain with a neat diagram various parts of a nuclear reactor, explain clearly the each part. **(06 Marks)**

b. Mention the factors to be considered for the selection of site for nuclear power plant. **(06 Marks)**

c. Describe construction and working of a pressurized water reactor. **(08 Marks)**

OR

6 a. With examples, explain the difference between a fissible material and a fertile material. **(04 Marks)**

b. Describe the different types of fuels used in a Nuclear power plant and discuss the problem of nuclear waste disposal. **(08 Marks)**

c. Explain the function of moderator, coolant, control rod and shielding in nuclear power plant. **(08 Marks)**

Module-4

7 a. Explain the function of transformer, high voltage circuit breaker and high voltage insulator in substation. **(06 Marks)**

b. Define substation and mention different types of substation. **(06 Marks)**

c. Explain resonant grounding and resistance grounding with a neat diagram. **(08 Marks)**

OR

8 a. Explain single bus-bar with bus sectionalizer. **(06 Marks)**

b. Explain Gas Insulated substation and mention its advantages. **(08 Marks)**

c. Explain Earthing Transformer with neat diagram. **(06 Marks)**

Module-5

9 a. Define Tariff. Explain (i) Block Rate Tariff (ii) Two Port Tariff (iii) KVA Maximum demand Tariff. **(06 Marks)**

b. Explain methods of determination of depreciation. **(09 Marks)**

c. Write a short notes on Classification of costs. **(05 Marks)**

OR

10 a. State the causes and effects of a poor power factor. Also explain methods of power factor improvement. **(10 Marks)**

b. Calculate the annual energy cost of an industrial consumer who takes a load of 20 kW for 1 hour per day, 150 kW for 7 Hours per day and 50 kW for 8 hours/day. The tariff in force is Rs. 20 per kilowatt of maximum demand (Maximum demand = 220 kW) and 10 paise per KWH. Assume 6 working days in a week. **(06 Marks)**

c. Explain concept of load sharing and choice of size and number of generating plants. **(04 Marks)**

* * * * *

CBCS SCHEME

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

17EE43

Fourth Semester B.E. Degree Examination, June/July 2019
Transmission and Distribution

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 advantages to transmit power at high voltage with explanation. **(07 Marks)**

b. The towers of height 30m and 90m respectively support a transmission line conductor at water crossing. The horizontal distance between the towers is 500m. If the tension in the conductor is 1600kg, find the minimum clearance of the conductor and water and clearance mid-way between the supports. Weight of conductor is 1.5kg/m. Bases of the towers can be considered to be at water level. **(07 Marks)**

c. List the methods of improving string efficiency and explain any one method with a neat sketch. **(06 Marks)**

OR

2 a. With a neat diagram, explain feeders, distributor and service main of a distribution system. **(06 Marks)**

b. A transmission line conductor having a diameter of 19.5mm weighs 0.85 kg/m. The span is 275 metres. The wind pressure is 39 kg/m^2 of projected area with ice coating of 13mm. The ultimate strength of the conductor is 8000kg. Calculate the maximum sag if the factor of safety is 2 and ice weighs 910 kg/m^3. **(07 Marks)**

c. A string has 3 units and each unit has a capacitance C. The pin to earth capacitance is C/10. Determine the values of voltage across each unit of the string and the string efficiency. **(07 Marks)**

Module-2

3 a. Derive an expression for the inductance of a conductor due to internal flux. **(08 Marks)**

b. The three conductors of a 3-phase transmission line are arranged in a horizontal plane and are 3 meters apart. The diameter of each conductor is 4cm. Determine the inductance per km of each phase. Assume balanced load and R, Y, B phase sequence. **(07 Marks)**

c. The three conductors of a 3-phase line are arranged at the corners of a triangle of sides 2m, 2.5m and 4.5m. Calculate the inductance per km of the line when the conductors are regularly transposed. The diameter of each conductor is 1.24cm. **(05 Marks)**

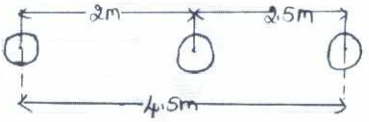
OR

4 a. Derive an expression for the line to neutral capacitance for a 3-phase overhead transmission line when the conductors are unsymmetrically spaced. **(10 Marks)**

b. A single-phase transmission line has two parallel conductors 3 metres apart, radius of each conductor being 1cm. Calculate the capacitance of the line per km. Given that $\in_0 = 8.854 \times 10^{-12}$ F/m. **(04 Marks)**

c. A 3-ϕ, 50Hz, 66kV overhead line conductors are placed in a horizontal plane as shown in Fig.Q.4(c). The conductor diameter is 1.25cm. If the line length is 100km, Calculate: i) Capacitance per phase ii) Charging current per phase, assuming complete transposition of the line. Given $\epsilon_0 = 8.854 \times 10^{-12}$. **(06 Marks)**

Fig.Q.4(c)



Module-3

5 a. Explain the nominal π method for obtaining the performance calculations of medium transmission line. Draw the corresponding vector diagram. **(10 Marks)**

b. A 3-ϕ line delivers 3600 kW at a pf 0.8 lagging to a load. If the sending end voltage is 33kV, determine: i) The receiving end voltage ii) Line current iii) Transmission efficiency. The resistance and reactance of each conductor are 5.31Ω and 5.54Ω respectively. **(07 Marks)**

c. Define voltage regulation. **(03 Marks)**

OR

6 a. Derive an expression for sending end voltage and current for long transmission line using rigorous solution. **(10 Marks)**

b. Two transmission lines having generalized circuit constants A_1, B_1, C_1, D_1 and A_2, B_2, C_2, D_2 are connected in series. Develop expressions for the overall constants ABCD of the combination in terms of A_1, B_1, C_1, D_1 and A_2, B_2, C_2, D_2. **(06 Marks)**

c. Explain Ferranti effect. **(04 Marks)**

Module-4

7 a. Explain the phenomenon of corona in overhead transmission line. **(06 Marks)**

b. A 132kV line with 1.956 cm diameter conductors is built so that corona takes place if the line voltage exceeds 210kV (rms). If the value of potential gradient at which ionization occurs can be taken as 30kV per cm, find the spacing between the conductors. Assume 3-ϕ. **(06 Marks)**

c. Derive the expression for the potential difference between core and earthed sheath in capacitance grading. **(08 Marks)**

OR

8 a. List the advantages and disadvantages of corona. **(05 Marks)**

b. A single core cable of conductor diameter 2cm and lead sheath of diameter 5.3cm is to be used on a 66 kV, 3-phase system. Two inter sheaths of diameter 3.1cm and 4.2cm are introduced between the core and lead sheath. If the maximum stress in the layers is the same, find the voltages on the inter sheaths. **(10 Marks)**

c. Write a note on inter sheath grading. **(05 Marks)**

Module-5

9 a. Explain the radial feeders used in distribution system. **(05 Marks)**

b. Explain the secondary distribution system: i) 3-ϕ distribution ii) Single phase two wire system. **(10 Marks)**

c. Write a note on power quality. **(05 Marks)**

OR

10 a. Explain the ring main or loop feeders in distribution system. **(06 Marks)**

b. Define: i) Reliability ii) Availability iii) Adequacy iv) Security. **(08 Marks)**

c. Write a note on limitations of distribution systems. **(06 Marks)**

* * * * *

CBCS SCHEME

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

17EE44

Fourth Semester B.E. Degree Examination, June/July 2019
Electric Motors

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. What is back emf? Explain its significance. **(06 Marks)**

b. Why a shunt motor should not be put on with field winding open? **(04 Marks)**

c. A 440V, dc shunt motor has a no load speed of 2000rpm. It is running at 1000 rpm at full load torque, reduced armature voltage and full load. If the load torque is reduced to 50% of rated value, with the armature voltage and field voltage held constant at previous voltages. **(10 Marks)**

OR

2 a. Briefly explain the various losses that occur in D.C. machine. Derive the condition for maximum efficiency of D.C. Motor. **(10 Marks)**

b. With a neat sketch, describe the working of three point starter. What are its limitations, what is the necessity of starter? **(10 Marks)**

Module-2

3 a. Explain back to back test as two identical D.C. machines and calculate the efficiency of machines as generator and motor. **(10 Marks)**

b. A 500V, D.C. shunt motor, when running on no load takes 5A. Armature resistance is 0.5Ω and shunt field resistance is 250Ω, find the output in kW and efficiency of motor, when running on full load and taking a current of 50A. **(10 Marks)**

OR

4 a. Discuss the torque – slip characteristics of a three phase induction motor including motoring generating and breaking regions. **(10 Marks)**

b. A 440V, 3ϕ, 50Hz, 4 pole star connected induction motor has full load speed of 1425 rpm. The rotor has an impedance of (0.4 + j4)Ω per phase and rotor/stator turns ratio of 0.8. Calculate: i) full load torque ii) full load copper loss iii) maximum torque and speed at which it occurs iv) starting current. **(10 Marks)**

Module-3

5 a. Starting from the fundamentals develop the equivalent circuit of a polyphase induction motor and explain how mechanical power developed is taken care of in equivalent circuit. **(10 Marks)**

b. Explain no load test and blocked rotor test in a 3ϕ induction motor. How are the parameters of equivalent circuit determined from test results? **(10 Marks)**

OR

6 a. What is the purpose of using deep bar rotor? Explain the construction and working of deep bar rotor induction motor. **(10 Marks)**

b. A 415V, 29.84kW, 50Hz delta connected motor gave the following test data.
No load test: 415V, 21A, 1250W
Blocked rotor test: 100V, 45A, 2730W
Construct the circle diagram and determine:
i) Line current and power factor for rated output
ii) The maximum torque. Assume stator and rotor copper losses are equal at stand still.
(10 Marks)

Module-4

7 a. Explain in detail auto-transformer method of starting a squirrel cage induction motor. **(10 Marks)**

b. Mention the different methods of speed control of 3ϕ induction motor, describe any two methods. **(10 Marks)**

OR

8 a. Explain double field revolving theory as applied to single phase induction motor and prove that it cannot produce any starting torque. **(10 Marks)**

b. Explain why single phase induction motor is not self starting. **(05 Marks)**

c. Briefly explain torque-speed characteristics of capacitor split phase motor. Mention the applications of capacitor split phase motors. **(05 Marks)**

Module-5

9 a. What are V and inverted V curves? Sketch them and explain their significance. **(10 Marks)**

b. Explain the operation of synchronous motor at constant load variable excitation. **(10 Marks)**

OR

10 a. State the methods of starting synchronous motor. Explain any one in details. **(05 Marks)**

b. Explain the importance of damper winding in synchronous motor. **(05 Marks)**

c. Explain the principle of operation of linear induction motor. List the some applications of it brief the working of linear induction motor. **(10 Marks)**

* * * * *

CBCS SCHEME

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

17EE46

Fourth Semester B.E. Degree Examination, June/July 2019
Operational Amplifiers and Linear ICs

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define and explain the following terms:
i) Input bias current
ii) Input offset current
iii) CMRR. **(06 Marks)**

b. With a neat circuit diagrams, explain working and design procedure of capacitor coupled voltage follower. **(08 Marks)**

c. For the circuit shown in Fig.Q.1(c), find V_0 given $R_F = 50K\Omega$ and $R_1 = 10K\Omega$ **(06 Marks)**

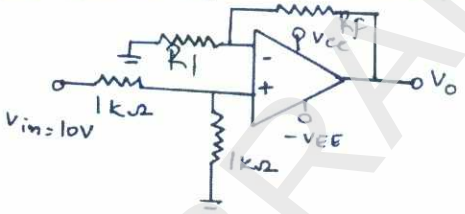


Fig.Q.1(c)

OR

2 a. What is an instrumentation amplifier? Obtain an expression for output voltage V_0, in terms of change in resistance 'ΔR' of an instrumentation amplifier using transducer bridge. **(12 Marks)**

b. Explain with a neat circuit, scaling and averaging amplifier using op-amp in inverting configuration. **(08 Marks)**

Module-2

3 a. Explain the following terms with respect to voltage regulator: i) Line regulation ii) Load regulation iii) Ripple rejection. **(06 Marks)**

b. With a neat circuit diagram, explain working of I order high pass filter and draw its typical frequency response curve. **(10 Marks)**

c. A first order low pass filter has cut off frequency of 1kHz the resistance value designed is 15.6KΩ. Calculate the new value of resistance. If the cut off frequency is to be changed to 1.6kHz. Assume capacitor value as constant. **(04 Marks)**

OR

4 a. Explain working and design of voltage follower regulator. **(07 Marks)**

b. An LM 317 voltage regulator is required to provide 6V output from 15V supply. Load current is 200mA. Design the circuit. Assume $I_1 = 1mA$ $V_{ref} = 1.25V$. **(06 Marks)**

c. Design a wide band pass filter with $f_L = 200Hz$, $f_H = 1kHz$ and pass band gain = 4. Assume capacitor values of high pass and low pass sections as 0.05μF and 0.01μF respectively. Also calculate Q-factor, band width and center frequency. **(07 Marks)**

Module-3

5 a. Explain the working of an inverting voltage comparator circuit. Draw the input, output waveforms when 'V_{ref}' is positive and negative. **(06 Marks)**

b. A triangular/rectangular waveform generator uses µA741 opamp with ±15V supply. Design a suitable circuit to obtain triangular output of $5V_{p-p}$, frequency variation from 200Hz to 2kHz and duty cycle adjustment from 20% to 80% of total time period. **(08 Marks)**

c. With a neat circuit diagram, explain working and design procedure of RC phase shift oscillator. **(06 Marks)**

OR

6 a. With a neat circuit diagram, explain non inverting Schmitt trigger, if UTP is to be made OV, explain the modification to be done in circuit, draw the relevant input/output waveforms. **(10 Marks)**

b. Explain the working of voltage to current converter with grounded load. **(04 Marks)**

c. With a neat circuit diagram, explain Sawtooth ware oscillator. **(06 Marks)**

Module-4

7 a. With a neat circuit diagram, explain working of a non saturation precision half wave rectifier and draw its input and output waveforms. **(08 Marks)**

b. Explain the working principle of linear RAMP analog to digital converter. **(06 Marks)**

c. Design a precision full wave rectifier to produce 2V peak output from sine wave input of peak value 0.5V and frequency of 1MHz, use 741 opamp with ±12V supply. **(06 Marks)**

OR

8 a. Explain R-2R ladder digital to analog converter circuit. **(10 Marks)**

b. Digital input for a 4-bit DAC is 0110. Calculate its analog equivalent output voltage. **(04 Marks)**

c. Explain working ADC using successive approximation method. **(06 Marks)**

Module-5

9 a. With a neat diagram, explain the internal architecture of IC555 timer. **(10 Marks)**

b. Explain the operating principle of phase locked loop. **(06 Marks)**

c. Define the terms related to PLL.

i) Lock range
ii) Capture range
iii) Pull in time
iv) Tracking range. **(04 Marks)**

OR

10 a. Explain how XOR gates can be used as phase detector in PLL. **(06 Marks)**

b. Explain monostable multivibrator, realized using IC555 timer. **(07 Marks)**

c. A PLL system with 105 kHz input has VCO with 100kHz free running frequency and sensitivity of 3.3 kHz/V. Phase detector has sensitivity of 0.68V/rad and amplifier gain of 5. Calculate : i) Loop gain ii) Phase difference iii) Static error voltage iv) Tracking range. **(07 Marks)**

* * * * *

CBCS SCHEME

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

17MATDIP41

Fourth Semester B.E. Degree Examination, June/July 2019
Additional Mathematics – II

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 rank of the matrix $\begin{bmatrix} 2 & 3 & 4 \\ -1 & 2 & 3 \\ 1 & 5 & 7 \end{bmatrix}$ by elementary row operations. **(08 Marks)**

b. Test for consistency and solve $x+y+z=6$, $x-y+2z=5$, $3x+y+z=8$. **(06 Marks)**

c. Solve the system of equations by Gauss elimination method :
$x+y+z=9$ $x-2y+3z=8$ $2x+y-z=3$ **(06 Marks)**

OR

2 a. Find all the eigen values and the corresponding eigen vectors of the matrix
$A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ **(08 Marks)**

b. Solve by Gauss elimination method $x_1-2x_2+3x_3=2$, $3x_1-x_2+4x_3=4$, $2x_1+x_2-2x_3=5$. **(06 Marks)**

c. If $A=\begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$ find A^{-1} by Cayley Hamilton theorem. **(06 Marks)**

Module-2

3 a. Solve $\frac{d^3y}{dx^2}-2\frac{d^2y}{dx^2}+4\frac{dy}{dx}-8y=0$. **(08 Marks)**

b. Solve $6\frac{d^2y}{dx^2}+17\frac{dy}{dx}+12y=e^{-x}$. **(06 Marks)**

c. Solve $y''-4y'+13y=\cos 2x$. **(06 Marks)**

OR

4 a. Solve $\frac{d^3y}{dx^3}+6\frac{d^2y}{dx^2}+11\frac{dy}{dx}+6y=0$. **(08 Marks)**

b. Solve $y''+2y+y=\frac{e^{\frac{x}{2}}+e^{-\frac{x}{2}}}{2}$. **(06 Marks)**

c. Solve $y''+2y'+y=2x+x^2$. **(06 Marks)**

Module-3

5 a. Find $L[\cosh at]$. **(08 Marks)**

b. Find $L[e^{-2t}\sinh 4t]$ **(06 Marks)**

c. Find $R\{t\sin 2t\}$. **(06 Marks)**

OR

6 a. Show that $\int_0^\infty t^3 e^{-st} \sin t dt = 0$. **(08 Marks)**

b. If $f(t) = t^2$, $0 < t < 2$ and $f(t + 2) = f(t)$ for $t > 2$, find $L[f(t)]$. **(06 Marks)**

c. Express $f(t) = \begin{cases} t, & 0 < t < 4 \\ 5, & t > 4 \end{cases}$ in terms of unit step function and hence find their Laplace Transforms. **(06 Marks)**

Module-4

7 a. Find the inverse Laplace Transform of $\frac{3}{s^2} + \frac{2e^{-s}}{s^3} - \frac{3e^{-2s}}{s}$. **(08 Marks)**

b. Find $L^{-1}\left[\frac{s^3 + 6s^2 + 12s + 8}{s^6}\right]$. **(06 Marks)**

c. Find the inverse Laplace Transform of $\frac{s+5}{s^2 - 6s + 13}$. **(06 Marks)**

OR

8 a. Solve by using Laplace Transform $\frac{d^2y}{dt^2} + k^2 y = 0$, given that $y(0) = 2$, $y'(0) = 0$. **(08 Marks)**

b. Find inverse Laplace Transform of $\frac{1}{(s+1)(s+2)(s+3)}$. **(06 Marks)**

c. Find $L^{-1}\left[\frac{s+1}{s^2 + 6s + 9}\right]$. **(06 Marks)**

Module-5

9 a. Find the probability that a leap year selected at random will contain 53 Sundays. **(08 Marks)**

b. A six faced die on which the numbers 1 to 6 are marked is thrown. Find the probability of (i) 3 (ii) an odd number coming up. **(06 Marks)**

c. State and prove Bayee's theorem. **(06 Marks)**

OR

10 a. A problem is given to three students A, B, C whose chances of solving it are $\frac{1}{2}, \frac{1}{4}, \frac{1}{5}$ respectively. Find the probability that the problem is solved. **(08 Marks)**

b. For any three events A, B, C, prove that $P\{(A \cup B)/C\} = P(A/C) + P(B/C) - P\{(A \cap B)/C\}$. **(06 Marks)**

c. Three machines A, B and C produce respectively 60%, 30% and 10% of the total number of items of a factory. The percentages of defective output of these machines are respectively 2%, 3% and 4%. An item is selected at random and is found defective. Find the probability that the item was produced by machine C. **(06 Marks)**

* * * * *