CBCS SCHEME

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17MAT11

First Semester B.E. Degree Examination, Feb./Mar. 2022
Engineering Mathematics – I

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 n^{th} derivative of $y = \cos 2x \cos 3x$. (06 Marks)

b. Find the angle of intersection between the curves $r = a\,\text{cosec}^2\left(\frac{\theta}{2}\right)$ and $r = b\sec^2\left(\frac{\theta}{2}\right)$. (07 Marks)

c. Find the radius of curvature of the curve $x^4 + y^4 = 2$ at the point (1, 1). (07 Marks)

OR

2 a. If $y = \tan^{-1}x$, prove that $(1 + x^2)\, y_{n+2} + 2(n+1)\, xy_{n+1} + n(n+1)\, y_n = 0$. (06 Marks)

b. Derive $\tan\phi = r\frac{d\theta}{dr}$ with usual notations. (07 Marks)

c. Prove that the radius of curvature of the curve $r^n = a^n \cos n\theta$. (07 Marks)

Module-2

3 a. Expand $\tan^{-1}x$ upto and including x^5 using Maclaurin's series. (06 Marks)

b. If $u = \log_e\left(\frac{x^3 + y^3}{x^2 + y^2}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 1$ (07 Marks)

c. If $u = \frac{x_2 x_3}{x_1}$, $v = \frac{x_1 x_3}{x_2}$, $w = \frac{x_1 x_2}{x_3}$, prove that $J\left(\frac{u, v, w}{x_1, x_2, x_3}\right) = 4$. (07 Marks)

OR

4 a. Evaluate $\underset{x \to 0}{\text{Limit}}\left(\frac{xe^x - \log(1+x)}{x^2}\right)$ (06 Marks)

b. Expand $f(x) = \log_e x$ about $x = 1$ upto the term containing third degree terms using Taylor's series. (07 Marks)

c. If $u = f(r, s, t)$ and $r = \frac{x}{y}$, $s = \frac{y}{z}$, $t = \frac{z}{x}$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$ (07 Marks)

Module-3

5 a. A particle moves along the curve $x = t^3 + 1$, $y = t^2$, $z = t + 5$, t – time, find the components of the velocity and acceleration at t = 2 in the direction of $\hat{i} + 3\hat{j} + 2\hat{k}$. (06 Marks)

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

c. Show that $\vec{F} = (6xy + z^3)i + (3x^2 - z)j + (3xz^2 - y)k$ is irrotational field. Find ϕ such that $F = \nabla\phi$. (07 Marks)

OR

6 a. Find the value of a for which $f = (x+3y)i + (y-2z)j + (x+az)k$ is solenoidal. **(06 Marks)**

b. Prove that div(curl A) = 0. **(07 Marks)**

c. If $\vec{A} = x^2 y\hat{i} - 2xz\hat{j} + 2yz\hat{k}$, find the value of curl (curl A). **(07 Marks)**

Module-4

7 a. Obtain the reduction formula of $\int \cos^n x\,dx$ and hence evaluate $\int_0^{\pi/2} \cos^n x\,dx$. **(06 Marks)**

b. Solve $(xy + y^2)\,dx + (x + 2y - 1)\,dy = 0$. **(07 Marks)**

c. Find the orthogonal trajectories of the curve $r = 4a \sec\theta \tan\theta$, a is the parameter. **(07 Marks)**

OR

8 a. Evaluate $\int_0^1 x^{3/2}(1-x)^{3/2}\,dx$ **(06 Marks)**

b. Solve $(1 + xy^2)xy\dfrac{dy}{dx} = 1$ **(07 Marks)**

c. A body originally at 80°C cools down to 60°C in 20min. The temperature of the air being 40°C. What will be the temperature of the body after 40min from the original? **(07 Marks)**

Module-5

9 a. Solve by Gauss Elimination method the system of equations

$x + 2y = 3 - z$

$2x + 3y + 3z = 10$

$3x - y + 2z = 13$ **(06 Marks)**

b. Find the largest Eigen value and the corresponding Eigen vector of the matrix $A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$ by power method choosing $[1\ 0\ 0]^T$ as initial vector for obtaining 4 approximations. **(07 Marks)**

c. Reduce quadratic form $6x^2 + 3y^2 + 3z^2 - 4xy + 4xz - 2yz$ to canonical form, using orthogonal transformation. **(07 Marks)**

OR

10 a. Find the rank of the matrix $A = \begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$ **(06 Marks)**

b. Reduce the matrix $A = \begin{bmatrix} 3 & 4 \\ -2 & -3 \end{bmatrix}$ into diagonal form. **(07 Marks)**

c. Find the inverse transformation of

$u_1 = 9v_1 + 6v_2$

$u_2 = 10v_1 - 2v_2$. **(07 Marks)**

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17PCD13/23

First/Second Semester B.E. Degree Examination, Feb./Mar. 2022
Programming in C and Data Structures

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 Pseudocode? Write a Pseudocode to find the area of a circle. (10 Marks)
b. What is variable? Explain how to declare and initialize a variable. (05 Marks)
c. What is an operator? Explain different relations operators with example. (05 Marks)

OR

2 a. What is an Algorithm? Write an algorithm to compute the area of rectangle. (10 Marks)
b. Explain the formatted Input/Output functions with its syntax and example. (10 Marks)

Module-2

3 a. What are the different forms of if-standard? Explain any two with syntax, flow chart and example. (12 Marks)
b. Write a C-program to find the sum of digits of a given integer number. (08 Marks)

OR

4 a. Explain switch statement with its syntax, flow chart and example. (08 Marks)
b. Explain the difference between while and do-while loops. (06 Marks)
c. Write the difference between break and continue statements. (06 Marks)

Module-3

5 a. What is an ARRAY? Explain the different ways of initializing an one dimensional array with an example. (10 Marks)
b. What is a function? Write a functional program to find the sum of two numbers. (10 Marks)

OR

6 a. With an example program explain different parameter passing techniques to a function. (10 Marks)
b. What is a string? Explain any five string handling functions? (10 Marks)

Module-4

7 a. What is structure? Write a program using structure to read the employee details such as employee number, name and salary of each employee and display total salary of all the employees. (12 Marks)
b. Explain any four file handling functions. (08 Marks)

OR

8 a. Explain with an example program how to pass structure to a function. **(08 Marks)**

b. Explain structure with in a structure with an example. **(05 Marks)**

c. What is a file? Explain different modes of file with an example. **(07 Marks)**

Module-5

9 a. What is a pointer? Explain how to declare and initialize a pointer variable. **(08 Marks)**

b. What is dynamic memory allocation? Explain the different dynamic memory allocation function. **(08 Marks)**

c. What is stack? Explain different operations performed on stack. **(04 Marks)**

OR

10 a. What is a Queue? Explain different operations performed on Queue. **(04 Marks)**

b. Explain the difference between static memory allocation and dynamic memory allocation. **(08 Marks)**

c. What is a macro? Write a program to find the square of a number using macros. **(08 Marks)**

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17ELE15/25

First/Second Semester B.E. Degree Examination, Feb./Mar. 2022
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. State and explain Kirchhoff's Laws as applied to D.C circuits. **(06 Marks)**

b. Define the co-efficient of coupling and find its relation with L_1, L_2 and M. **(06 Marks)**

c. In the circuit shown in Fig Q1(c), what is the voltage across AB if (i) Switch S in open and (ii) Switch S is closed.

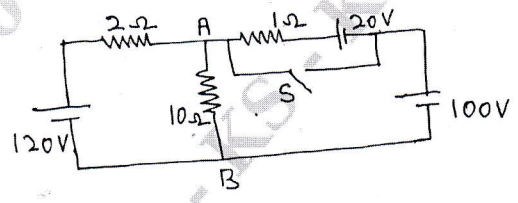

Fig Q1(c) **(08 Marks)**

OR

2 a. State and explain Faraday's Laws of Electro-magnetic inductions. **(06 Marks)**

b. Derive an expression for the energy stored in an inductive coil. **(06 Marks)**

c. A circuit consists of two parallel resistors having resistances of 20Ω and 30Ω respectively connected in series with 15Ω. If the current through 15Ω resistor is 3A, find : i) Current in 20Ω and 30Ω resistor ii) The voltage across the whole circuit iii) The total power and power consumed in all resistances. **(08 Marks)**

Module-2

3 a. Define back emf of D.C motor. What is its significance? **(04 Marks)**

b. With a neat sketch, explain the construction of the various parts of a D.C generator. **(08 Marks)**

c. With a neat figure, explain the construction and working principle of a dynamometer type Wattmeters. **(08 Marks)**

OR

4 a. Deriver the Torque equations of a D.C motor. **(06 Marks)**

b. Sketch the various characteristics of D.C shunt and D.C series motor. **(06 Marks)**

c. A 4 pole 220V, lap connected D.C shunt motor has 36 slots, each slot containing 16 conductors; it draws a current of 40A from the supply. The field resistance and armature resistances are 110Ω and 0.1Ω respectively. The motor develops an output power of 6kW. The flux per pole is 40mwb. Calculate: i) The speed ii) The Torque developed by armature and iii) The shaft torque. **(08 Marks)**

Module-3

5 a. Define and derive an expression for root mean square value of an alternating quantity. **(06 Marks)**

b. Derive an equation for the power consumed by an R-L series circuit. Draw the waveform of voltage, current and power and draw the phasor diagram, **(08 Marks)**

c. With a neat figure, explain pipe earthing. **(06 Marks)**

OR

6 a. With a circuit diagram, explain the working of a two way control of a Lamp. **(06 Marks)**

b. A circuit consists of a resistance of a 10Ω, an inductance of 16mH and a capacitance of 150μF connected in series. A supply of 100V at 50Hz is given to the circuit. Find the current, p.f and power consumed by the circuit. Draw the vector diagram. **(06 Marks)**

c. Two circuits A and B connected in parallel across 200V, 50Hz supply circuit. A consists of 10Ω resistance of 0.12H inductance in series while circuit B consists of 20Ω resistance in series with 40μF capacitance. Calculate i) current in each branch ii) Supply current iii) Total power factor. Draw the phasor diagrams. **(08 Marks)**

Module-4

7 a. Derive the emf equation of A.C generator. **(06 Marks)**

b. Show that the two Wattmeters are sufficient to measure three phase power. Also derive an expression for the power factor in terms of wattmeter readings. **(08 Marks)**

c. When three balanced impedance are connected in star across a 3 phase 415V, 50Hz supply. The line current drawn is 20A, at a Lagging p.f of 0.4. Determine the parameters of the impedance in each phase. **(06 Marks)**

OR

8 a. In a three phase Delta connection, find the relation between line and phase values of current and voltages. Also derive the equation for three phase power. **(06 Marks)**

b. With neat sketches, explain the construction of salient pole alternator. **(06 Marks)**

c. A 24 pole turbo alternator has star connected armature winding with 144 slots and 10 conductors per slot, it is driven by a low speed Kaplan turbine at a speed of 250 rpm. The winding has full pitched coils with a distribution factor of 0.966. The flux per pole is 67.3mwb. Determine: i) The frequency and magnitude of line voltage ii) The output KVA of the machine, if the total current in each phase is 50A. **(08 Marks)**

Module-5

9 a. Derive EMF equation of transformer. **(06 Marks)**

b. Derive the condition for which the efficiency of a transformer is maximum. **(06 Marks)**

c. A 3 phase, 6 pole, 50Hz Induction motor has a slip of 1% at no-load, and 3% at full load. Determine : i) Synchrous speed ii) no-load speed iii) Full load speed iv) Frequency of rotor current at stand still v) Frequency of rotor current at full load. **(08 Marks)**

OR

10 a. Explain clearly the working principle of a three phase induction motor. **(06 Marks)**

b. A single phase 20KVA transformer has 1000 primary turns and 2500 secondary turns. The net cross sectional area of the core is $100cm^2$. When the primary winding is connected to 500V 50Hz supply, calculate: i) The maximum flux density in the core ii) The voltage induced in the secondary winding iii) The primary and secondary full load currents. **(06 Marks)**

c. A single phase transformer working at 0.8p.f has an efficiency of 94% at both three fourth full load of 600kW. Determine the efficiency at half full load, unity power factor. **(08 Marks)**

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17ELN15/25

First/Second Semester B.E. Degree Examination, Feb./Mar. 2022
Basic Electronics

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Draw and explain the VI – characteristics of a PN-junction diode. **(08 Marks)**

b. With neat circuit diagram, explain the working principles of full wave bridge rectifier. **(08 Marks)**

c. Derive the relationship between α and β. Also calculate the value of α and β value of a transistor if $I_B = 100\mu A$ and $I_C = 2\mu A$. **(04 Marks)**

OR

2 a. With a neat diagram, explain the input and output characteristics of a transistor in common base configuration. **(08 Marks)**

b. With neat diagram and wave forms, explain the working of a halfwave rectifier. **(08 Marks)**

c. Define : i) Zener breakdown ii) Avalanche breakdown. **(04 Marks)**

Module-2

3 a. What is op-Amp? List the characteristics of an ideal op-amp. **(06 Marks)**

b. For the base bias circuit for npn transistor, find I_β, I_C and V_{CE} if $R_C = 2K\Omega$, $R_B = 220K\Omega$, $\beta = 60$, $V_{BE} = 0.7V$ and $V_{CC} = 18V$. **(06 Marks)**

c. Explain with neat circuit diagram op-amp integrator. **(08 Marks)**

OR

4 a. With neat circuit diagram, explain the voltage divider bias circuit. **(06 Marks)**

b. Find the output voltage of a three input adder circuit in which $R_1 = R_2 = R_3 = 4K\Omega$ and feedback resistance $R_F = 6K\Omega$ and given that $V_1 = -4V$, $V_2 = -2V$ and $V_3 = 3V$. **(05 Marks)**

c. Explain briefly non-inverting, inverting and voltage follower circuit using operation amplifier. **(09 Marks)**

Module-3

5 a. Convert the following :

i) $(69)_{10} = (?)_2$ ii) $(101010101)_2 = (?)_{10}$ iii) $(FA876)_{16} = (?)_2$

iv) $(867)_{10} = (?)_8$ v) $(57345)_{10} = (?)_{16}$ vi) $(BCDE)_{16} = (?)_8$. **(09 Marks)**

b. State and prove De – Morgan's theorem for 2 variables with truth table. **(06 Marks)**

c. Realize AND, OR, NOT using universal gates. **(05 Marks)**

OR

6 a. Explain half adder. Design the full adder circuit by using two half adder circuits. **(08 Marks)**

b. Simplify the following :

i) $Y = \overline{A}\overline{B}\overline{C}\overline{D} + \overline{A}\overline{B}CD + A\overline{B}\overline{C}\overline{D} + A\overline{B}CD$

ii) $Y = AB + AC + BD + CD$. **(06 Marks)**

c. Perform the following :

i) (22 – 17) by using 2's complement method

ii) $(11010110)_2 - (01000101)_2$ by using 1's complement method. **(06 Marks)**

Module-4

7 a. What is the flip-flop? Explain with circuit diagram and truth table NOR gated SR – flip-flop. **(08 Marks)**

b. Explain the architecture of 8051 microcontroller. **(12 Marks)**

OR

8 a. With the help of block diagram, explain the micro controller based stepper motor control system. **(08 Marks)**

b. With the diagram and truth table explain NAND gate latch. **(06 Marks)**

c. Explain the register banks of 8051 microcontroller. **(06 Marks)**

Module-5

9 a. Explain the communication system with neat block diagram. **(08 Marks)**

b. Explain the construction and working operation of linear variable differential transducer's. **(06 Marks)**

c. A 500W 1MHz carrier is amplitude modulated with a sinusoidal signal of 1KHz, the depth of modulation is 60%. Calculate the Bandwidth and power in the side band, sideband frequencies and total power in the modulated wave. **(06 Marks)**

OR

10 a. Define modulation. Derive the mathematical expression for the amplitude modulation and the wave forms. **(08 Marks)**

b. List the differences between amplitude modulation and frequency modulation. **(06 Marks)**

c. What is transducer? Explain active transducer and passive transducer. **(06 Marks)**

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17MAT21

Second Semester B.E. Degree Examination, Feb./Mar. 2022
Engineering 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. Solve : $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 2\cos x$ by inverse differential operator method. **(06 Marks)**

b. Solve : $(D-2)^2 y = 8(e^{2x})$ by inverse differential operator method. **(07 Marks)**

c. Solve : $\frac{d^2y}{dx^2} + y = \tan x$ by the method of variation of parameters. **(07 Marks)**

OR

2 a. Solve : $(D^2 - 2D + 5)y = e^{2x}$ by inverse differential operator method. **(06 Marks)**

b. Solve : $y'' + 16y = \sin 3x$ by inverse differential operator method. **(07 Marks)**

c. Solve : $y'' - 5y' + 6y = e^{3x} + x$ by the method of undertermined coefficients. **(07 Marks)**

Module-2

3 a. Solve : $(2x+1)^2 y'' - 6(2x+1)y' + 16y = 8(2x+1)^2$ **(06 Marks)**

b. Solve : $p^2 - 7p + 10 = 0$. **(07 Marks)**

c. Solve : sinp x cosy = cosp x siny + p as a Clairaut's equation. Also find the singular solution. **(07 Marks)**

OR

4 a. Solve : $x^3\frac{d^3y}{dx^3} + 3x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + 8y = 65\cos(\log x)$ **(06 Marks)**

b. Solve : $x^2p^2 + xyp - 6y^2 = 0$ **(07 Marks)**

c. Solve : $p^2 + 2py\cot x - y^2 = 0$ **(07 Marks)**

Module-3

5 a. Form the partial differential equation by eliminating the arbitrary function from $z = f\left(\frac{xy}{z}\right)$. **(06 Marks)**

b. Solve: $\frac{\partial^2 z}{\partial x^2} = xy$ subject to the conditions that $\frac{\partial z}{\partial x} = \log(1+y)$ when x = 1 and z = 0 when x = 0. (Use direct integration method). **(07 Marks)**

c. Obtain the solution of one dimensional heat equation $\frac{\partial u}{\partial t} = c^2\frac{\partial^2 u}{\partial x^2}$ by the method of separation of variables for the positive constant. **(07 Marks)**

OR

6 a. Form the partial differential equation by eliminating arbitrary function from $\phi(x+y+z,\ x^2+y^2-z^2)=0$ **(06 Marks)**

b. Derive one dimensional wave equation in the form $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$. **(07 Marks)**

c. Solve : $\frac{\partial^2 z}{\partial x^2} + z = 0$ given that when $x = 0$, $z = e^y$ and $\frac{\partial z}{\partial x} = 1$. **(07 Marks)**

Module-4

7 a. Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z}\, dxdydz$ **(06 Marks)**

b. Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2 dxdy$ by changing the order of integration. **(07 Marks)**

c. Derive the relation between beta and gamma function as $\beta(m,n) = \frac{\Gamma(m)\,\Gamma(n)}{\Gamma(m+n)}$. **(07 Marks)**

OR

8 a. Evaluate $\int_{-c}^{c} \int_{-b}^{b} \int_{-a}^{a} (x^2+y^2+z^2)\, dz\, dy\, dx$ **(06 Marks)**

b. Find the area bounded between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ using double integration. **(07 Marks)**

c. Evaluate $\int_0^1 x^{3/2}(1-x)^{1/2} dx$ using beta and gamma functions. **(07 Marks)**

Module-5

9 a. Find the Laplace transform of $2^t + \frac{\cos 2t - \cos 3t}{t}$ **(06 Marks)**

b. Given $f(t) = \begin{cases} E, & 0 < t < a/2 \\ -E, & a/2 < t < a \end{cases}$ where $f(t + a) = f(t)$, show that $L\{f(t)\} = \frac{E}{S}\tanh\left(\frac{as}{4}\right)$. **(07 Marks)**

c. Find the Inverse Laplace transform of $\frac{s^2}{(s^2+a^2)^2}$ using convolution theorem. **(07 Marks)**

OR

10 a. Find $L^{-1}\left\{\frac{3s+7}{s^2-2s-3}\right\}$ **(06 Marks)**

b. Express the function $f(t) = \begin{cases} \cos t, & 0 < t \le \pi \\ 1, & \pi < t \le 2\pi \\ \sin t, & t > 2\pi \end{cases}$ into unit step function hence find its Laplace transform. **(07 Marks)**

c. Solve: $y'' - 2y' + y = e^t$ given $y(0) = y'(0) = 0$ using Laplace transform. **(07 Marks)**

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