CBCS SCHEME

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

17MAT41

Fourth Semester B.E. Degree Examination, Jan./Feb.2021
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. Using Taylor's series method, compute the solution of $\frac{dy}{dx} = x - y^2$ with $y(0) = 1$ at $x = 0.1$, correct to fourth decimal place. **(06 Marks)**

b. Using modified Euler's formula, solve the $\frac{dy}{dx} = x + \left|\sqrt{y}\right|$ with $y(0.2) = 1.23$ at $x = 0.4$ by taking $h = 0.2$. **(07 Marks)**

c. The following table gives the solution of $\frac{dy}{dx} = x^2 + \frac{y}{2}$. Find the value of y at $x = 1.4$ by using Milne's Predictor-Corrector method.

x	1	1.1	1.2	1.3
y	2	2.2156	2.4649	2.7514

(07 Marks)

OR

2 a. Using modified Euler's method, solve $\frac{dy}{dx} = \log_{10}\left(\frac{x}{y}\right)$ with y(20) = 5 at $x = 20.2$ by taking h = 0.2. **(06 Marks)**

b. Employ the Range-Kutta method of fourth order to solve $\frac{dy}{dx} = 3x + \frac{y}{2}$, with $y(0) = 1$ at $x = 0.1$ by taking $h = 0.1$. **(07 Marks)**

c. Using Adams-Bashforth method, find y when $x = 1.4$ given $\frac{dy}{dx} = x^2(1 + y)$, with y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548, y(1.3) = 1.979 **(07 Marks)**

Module-2

3 a. Using Runge-Kutta method of fourth order solve the differential equation, $\frac{d^2y}{dx^2} = x^3\left(y + \frac{dy}{dx}\right)$ for $x = 0.1$. Correct to four decimal places with initial conditions $y(0) = 1$, $y'(0) = 0.5$. **(06 Marks)**

b. Obtain the series solution of Legendre Differential equation leading to Pn(x). **(07 Marks)**

c. With usual notation, show that $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}}\sin x$. **(07 Marks)**

OR

4 a. Apply Milne's method to compute y(1.4) given that $2\frac{d^2y}{dx^2} = 4x + \frac{dy}{dx}$ and

x	1	1.1	1.2	1.3
y	2	2.2156	2.4649	2.7514
y′	2	2.3178	2.6725	3.0657

(06 Marks)

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

c. Express $f(x) = 3x^3 - x^2 + 5x - 2$ in terms of Legendre's polynomials. **(07 Marks)**

Module-3

5 a. State and prove Cauchy-Riemann equations in polar form. **(06 Marks)**

b. If $V = e^{-2y} \sin 2x$, find the analytic function f(z). **(07 Marks)**

c. Find the bilinear transformation that maps the points 0, i, ∞ onto the points 1, $-i$, -1. **(07 Marks)**

OR

6 a. State and prove Cauchy's theorem on complex integration. **(06 Marks)**

b. Evaluate $\oint_C \frac{z^2+5}{(z-2)(z-3)} dz$, where $C : |z| = \frac{5}{2}$. **(07 Marks)**

c. Discuss the transformation $W = Z + \frac{1}{Z}$. **(07 Marks)**

Module-4

7 a. A box contains 100 transistors, 20 of which are defective and 10 are selected at random, find the probability that (i) all are defective (ii) at least one is defective (iii) all are good (iv) at most three are defective. **(06 Marks)**

b. Show that mean and standard deviation of exponential distribution are equal. **(07 Marks)**

c. The joint probability is,

X \ Y	0	1	2	3
0	0	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$
1	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$	0

(i) Find marginal distributions of X and Y.

(ii) Also find E(X), E(Y) and E(XY). **(07 Marks)**

OR

8 a. Find the mean and variance of binomial distribution. **(06 Marks)**

b. In an examination taken by 500 candidates the average and the standard deviation of marks obtained (normally distributed) are 40% and 10%. Find approximately,

(i) How many will pass, if 50% is fixed as a minimum?

(ii) What should be the minimum if 350 candidates are to pass?

(iii) How many have scored marks above 60%? **(07 Marks)**

c. Suppose X and Y are independent random variables with the following distributions:

x_i	1	2
$f(x_i)$	0.7	0.3

y_j	-2	5	8
$g(y_j)$	0.3	0.5	0.2

Find the joint distribution of X and Y. Also find the expectations of X and Y and covariance of X and Y. **(07 Marks)**

Module-5

9 a. The average income of persons was Rs.210 with a standard deviation of Rs.10 in sample of 100 people of a city. For another sample of 150 persons, the average income was Rs.220 with standard deviation of Rs.12. The standard deviation of the incomes of the people of the city was Rs.11. Test whether there is any significant difference between the average incomes of the localities. (Use $Z_{0.05} = 1.96$) **(06 Marks)**

b. A certain stimulus administered to each of the 12 patients resulted in the following change in blood pressure : 5, 2, 8, −1, 3, 0, 6, −2, 1, 5, 0, 4. Can it be concluded that the stimulus will increase the blood pressure? ($t_{0.05}$ for 11 d.f = 2.201). **(07 Marks)**

c. Define stochastic matrix. Find a unique fixed probability vector for the matrix $\begin{bmatrix} 0 & 1 & 0 \\ \frac{1}{6} & \frac{1}{2} & \frac{1}{3} \\ 0 & \frac{2}{3} & \frac{1}{3} \end{bmatrix}$. **(07 Marks)**

OR

10 a. Explain the following terms:
(i) Type I and Type II errors.
(ii) Null hypothesis.
(iii) Level of significance.
(iv) Confidence limits. **(06 Marks)**

b. Eleven school boys were given a test in mathematics carrying a maximum of 25 marks. They were given a month's extra coaching and a second test of equal difficulty was held thereafter. The following table gives the marks in two tests.

Boy	1	2	3	4	5	6	7	8	9	10	11
Marks (I test)	23	20	21	18	18	20	18	17	23	16	19
Marks (II test)	24	19	18	20	20	22	20	20	23	20	17

Do the marks give evidence that the students have benefitted by extra coaching? (Given $t_{0.05} = 2.228$ for 10 d.f) **(07 Marks)**

c. Three boys A, B and C are throwing ball to each other. A always throws the ball to B and B always throws the ball to C. C is just as likely to throw the ball to B as to A. If C was the first person to throw the ball, find the probabilities that after three throws (i) A has the ball, (ii) B has the ball, (iii) C has the ball. **(07 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | **17EE43**

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
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. Draw a line diagram of a typical power scheme indicating the standard voltages used at different levels. Explain: i) Feeders ii) Distributors iii) Service mains. **(10 Marks)**

b. A transmission line conductor at a river crossing is supported from two towers at heights of 50 and 80 meters above water levels. The horizontal distance between the towers is 300 metres. If the tension in the conductor is 2000kg, find the clearance between the conductor and water at a point midway between the towers. Weight of conductor per metre is 0.844kg. **(10 Marks)**

OR

2 a. What are the advantages of high voltage AC transmission line? **(05 Marks)**

b. Derive an expression for string efficiency of a 3 disc string. **(05 Marks)**

c. Write short notes on:

i) Vibrations of conductors

ii) Effect of wind and Ice on transmission line. **(10 Marks)**

Module-2

3 a. Explain the concept of self GMD and mutual GMD. **(04 Marks)**

b. Derive an expression for the inductance of a single phase two wire line. **(06 Marks)**

c. The below Fig.Q.3(c) shows the spacing of a double limit 3-phase overhead lines. The conductor radius is 1.3cm and line is transposed. Find the inductance per phase per kilometer. **(10 Marks)**

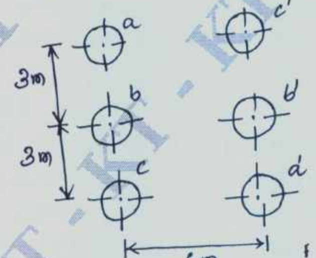

Fig.Q.3(c)

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. Derive an expression for the inductance of a conductor due to internal and external flux. **(10 Marks)**

Module-3

5 a. Derive an expression for ABCD constants of a medium transmission line using nomial T-method. Also prove that line is symmetrical and reciprocal. **(10 Marks)**

b. A 3-ϕ short transmission line delivers 5000kW at 22kV and at a pf of 0.8 lagging to a load. Determine: i) Sending end voltage ii) % regulation iii) Transmission efficiency. The resistance and reactance of each conductor is 4Ω and 6Ω respectively. **(10 Marks)**

OR

6 a. Explain Ferranti effect. **(06 Marks)**

b. A 3-ϕ, 50Hz, 150km transmission line has the following constants.
Resistance/phase/km = 0.1Ω
Reactance/phase/km = 0.5Ω
Capacitance shunt admittance/phase/ km = 3×10^{-6} mho
If the line supplies a load of 50MW at 0.8pf lagging at 110KV at the receiving end, calculate by using nomial π-method. i) Sending end current ii) Sending end voltage iii) Sending end power factor. **(14 Marks)**

Module-4

7 a. Explain the phenomenon of corona in overhead transmission line. Also discuss the factors affecting the corona. **(10 Marks)**

b. Derive an expression for critical disruptive voltage and visual critical voltage reference to corona. **(05 Marks)**

c. A 3-ϕ line has conductors of 2cm in diameter, spaced equilaterally 1m apart. If the dielectric strength of air is 30KV/cm (max), find the critical disruptive voltage for the line. Air density factor $\delta = 0.952$ and irregularity factor $m_0 = 0.9$. **(05 Marks)**

OR

8 a. What are the methods of grading of cables? Explain capacitance grading of cables. **(10 Marks)**

b. Discuss the different types of cables based on the voltage level. **(10 Marks)**

Module-5

9 a. Briefly explain the radial and ring main distributors. **(08 Marks)**

b. Draw the schematic diagram and hence obtain the expressions for voltages at different tappings of a DC distributor fed at one end with concentrated loads. **(12 Marks)**

OR

10 a. What is the power quality? What are the different power quality problems? **(05 Marks)**

b. What are the requirements of good distribution system? **(05 Marks)**

c. A 2 wire distributor AB is fed at A and supplied six concentrated loads each of 50A at C, D, E, F, G and H as shown in Fig.Q.10(c). What must be the resistance of each section so that maximum voltage drop for any consumer does not exceed 7V. Also calculate the total power loss with this resistance. Assume that the loads are spaced at equal distances. **(10 Marks)**

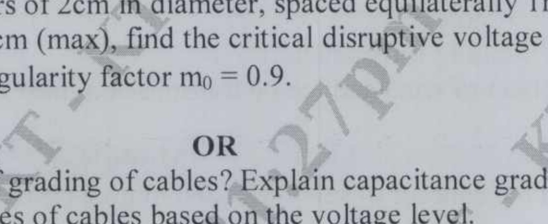

Fig.Q.10(c)

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CBCS SCHEME

USN | | | | | | | | | |

17MATDIP41

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
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 $\begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 16 & 8 & -6 & -2 \end{bmatrix}$ by elementary applying row transformation. **(06 Marks)**

b. Solve the following system of linear equation by Gauss Elimination method $x + 2y + z = 3$, $2x + 3y + 3z = 10$, $3x - y + 2z = 13$ **(07 Marks)**

c. Find the inverse of the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ using Cayley-Hamilton theorem. **(07 Marks)**

OR

2 a. Reduce the matrix $\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$ into its echelon form and hence find its rank. **(06 Marks)**

b. Find the Eigen values and Eigen vectors of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$. **(07 Marks)**

c. Solve the following system of linear equation by Gauss Elimination method $x + y + z = 9$, $x - 2y + 3z = 8$, $2x + y - z = 3$. **(07 Marks)**

Module-2

3 a. Solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 6e^{3x}$ **(06 Marks)**

b. Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = \cos 3x$ **(07 Marks)**

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

OR

4 a. Solve $\frac{d^2y}{dx^2} + 4y = x^2$ **(06 Marks)**

b. Solve $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = \frac{e^x + e^{-x}}{2}$ **(07 Marks)**

c. Solve $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 4e^{3x}$ by the method of undetermined coefficients. **(07 Marks)**

Module-3

5 a. Prove that $L[\text{Cosh } at] = \frac{s}{s^2 - a^2}$ **(06 Marks)**

b. Find the Laplace transform of cost cos2t cos3t **(07 Marks)**

c. Find the Laplace transform of $f(t) = \begin{cases} t & 0 \le t \le a \\ 2a - t & a < t \le 2a \end{cases}$ where $f(t + 2a) = f(t)$ **(07 Marks)**

OR

6 a. Find the Laplace transform of sint sin2t sin3t. **(06 Marks)**

b. Find the Laplace transform of t^2sin at. **(07 Marks)**

c. Express $f(t) = \begin{cases} t^2 & 1 < t \le 2 \\ 4t & t > 2 \end{cases}$ interms of unit step function and hence find $L\{f(t)\}$. **(07 Marks)**

Module-4

7 a. Find the inverse Laplace transform of $\frac{1}{s(s+1)(s+2)}$ **(06 Marks)**

b. Find the inverse Laplace transform of $\log \frac{(s^2+1)}{s(s+1)}$ **(07 Marks)**

c. Using Laplace transform, solve $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 0$ under the initial condition y(0) = 1 y′(0) = 0. **(07 Marks)**

OR

8 a. Find the inverse Laplace transform of $\log\left(\frac{s+a}{s+b}\right)$. **(06 Marks)**

b. Find the inverse Laplace transform of $\frac{5s+3}{(s-1)(s^2+2s+5)}$. **(07 Marks)**

c. Solve by using Laplace transform $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$ under the initial condition y(0) = 0, y′(0) = 0. **(07 Marks)**

Module-5

9 a. Prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. **(06 Marks)**

b. Find the probability that a leap year selected at random will contain 53 Sundays. **(07 Marks)**

c. An office has 4 secretaries handling 20%, 60%, 15%, 5% respectively of the files of certain reports. The probabilities that they misfile such reports are respectively 0.05, 0.1, 0.1 and 0.05. Find the probability that a misfiled report is caused by the first secretary. **(07 Marks)**

OR

10 a. State and prove Baye's theorem. **(06 Marks)**

b. A problem is given to four students A, B, C, D whose chances of solving it are 1/2, 1/3, 1/4, 1/5 respectively. Find the probability that the problem is solved. **(07 Marks)**

c. Three machines A, B, C produce 50%, 30% and 20% of the items in a factory. The percentage of defective outputs of these machines are 3%, 4% and 5% respectively. If an item is selected at random. What is the probability that it is defective? If a selected item is defective, what is the probability that it is from machine A? **(07 Marks)**

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