Code No. 5017 / O

FACULTY OF ENGINEERING

B.E. 2/4 (Civil) I - Semester (Old) Examination, December 2015

Subject : Mathematics – III (Common to All Except I.T./ ECE)

Time : 3 Hours **Max. Marks: 75**

Note: Answer all questions from Part-A and answer any five questions from Part-B.

PART – A (25 Marks)

1 Form the differential equation by eliminating the arbitrary function ‘f’ and ‘g’ from $Z = y\,f(x) + x\,g(y)$ (3)

2 Solve $x^2p^2 + y^2q^2=z^2$ (2)

3 Find an in the Fourier series expansion of $f(x) = x^2$ in $(-\ell , \ell)$. (3)

4 Write Dirichlet’s conditions. (2)

5 Solve $\sqrt{p} + \sqrt{q} = 2x$. (3)

6 Solve $\frac{\partial^2 z}{\partial x \partial y} = \frac{x}{y}$. (2)

7 Apply Euler’s method to find y(0.4) for $y^1 = x + y$, y(0) =0 choosing the scap length = 0.2. (3)

8 If f(4) = 7, f(6) = 13 f(0) = 14, f(12) = 10. Find f(11). (2)

9 Find Z – Transform of sin (3n+5). (3)

10 State and prove the initial value theorem. (2)

PART – B (50 Marks)

11 (a) Solve $(x^2 – y^2 – z^2)\, p + 2xyz = 2xz$. (5)

(b) Solve $r – t \cos^2x + p \tan x = 0$ by Monse’s method. (5)

12 If f(x) = |cos x|, then expand f(x) as a Fourier series in the interval $(-\Pi,\Pi)$. (10)

13 The ends A and B of a rod 20 cm long have the temperature at 30^oC and 80^oC until steady-state prevails. The temperature of the ends are changed to 40^oC and 60^oC respectively. Find the temperature distribution in the rod at time ‘t’. (10)

14 (a) Solve the system of equations (5)

$2x + 2y + z = 12$, $3x + 2y + 2z = 8$, $5x + 10y – 8z = 10$ by Gauss – Condition method.

(b) Solve the differential equation $\frac{dy}{dx} = x + y$ using Runge-Kutta method of fourth order for x = 0.2 with initial conditions y(0) = 1. (5)

15 (a) Find the inverse Z – transform of $2(z2-5z + 6.5) / [(z-2)\,(z-3)^2]$ for $2 <|z|<3$. (5)

(b) State and prove convolution theorem. (5)

16 Solve $p(p^2+1)+(b-z)q=0$ by Charpit’s method. (10)

17 (a) Find the Halfrange sine Fourier series expansion of $f(x)=x^2$ in $(0, \Pi)$. (5)

(b) Find $\frac{dy}{dx}$ at x = 1.3 from the following table:

x	1	3	5	7
y	10	17	24	29

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Code No. 5050 / N

FACULTY OF ENGINEERING

B.E. 2/4 I - Semester (New)(Main) Examination, December 2015

Subject : Mathematics – III (Common to All Except. I.T./ ECE)

Time : 3 Hours **Max. Marks: 75**

Note: Answer all questions from Part-A and answer any five questions from Part-B.

PART – A (25 Marks)

1 From a partial differential equation by eliminating arbitrary constants a and b from $z = a(x+y)+b$. (2)

2 Solve $p^2 - q^2 = x - y$. (3)

3 Define odd and even functions with an example. (2)

4 Solve by the method of separation of variables $\frac{\partial z}{\partial x} - 2\frac{\partial z}{\partial y} - z = 0$, where $z(x, 0) = 6e^{-3x}$. (3)

5 State Baye's theorem. (2)

6 If X is a continuous random variable and b is a constant then show that $Var(bX) = b^2 Var(X)$. (3)

7 Find mean of Poisson distribution. (2)

8 Write any two applications of χ^2 test. (3)

9 The lines of regression in a bivariate distribution are $x + 9y = 7$ and $y + 4x = \frac{49}{3}$. Find coefficient of correlation. (2)

10 Fit a straight line for the following data: (3)

x	0	1	2	3
y	1	2	2	3

PART – B (50 Marks)

11 (a) Solve $p + q + 2xz = 0$. (5)

(b) Solve by Charpit's method $px + pq + qy = yz$. (5)

12 (a) Obtain the Fourier series to represent (5)

$$f(x) = \begin{cases} 0, & -x < x < 0 \\ \frac{\text{®}x}{4}, & 0 < x < \text{®} \end{cases}$$

(b) Find half range consine series for $f(x) = \pi - x$ in the interval $0 < x < \pi$. (5)

13 (a) If the first four moments of a distribution about a value 5 are equal to -4, 22, -177 and 560. Determine moments about mean. (5)

(b) Given the following table. (5)

x	-3	-2	-1	0	1	2	3
P(x)	0.05	0.10	0.30	0	0.30	0.15	0.10

Compute (i) E(x) (ii) E(2+3x) (iii) V(x)

14 (a) In a book of 520 pages, 390 typo-graphical errors occur. Assuming Poisson Law for the number of errors per page. Find the probability that a random sample of 5 pages will have no errors. (5)

(b) Find MGF of normal distribution. (5)

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15 (a) Find regression line of y on x for following data: (5)

x	1	3	4	5	7	8	10
y	2	6	8	10	14	16	20

(b) Fit a second degree parabola for following data: (5)

x	2	4	6	8
y	25	38	56	84

16 A string is stretched and fastened to two points ℓ apart. Motion is started by displacing the string into the form $y = 2(\sin x + \sin 3x)$ from which it is released at time $t = 0$. Find the displacement of any point on the string at a distance of x from one end at time t. (10)

17 (a) A random sample of 10 boys had the following I.Q's : 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support assumption of population mean I.Q of 100? (5)

(b) Find the angle between two regression lines. (5)

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Code No. 5064 / A / N

FACULTY OF ENGINEERING

B.E. 2/4 (ECE) I - Semester (New)(Main) Examination, December 2015

Subject : Applied Mathematics

Time : 3 Hours **Max. Marks: 75**

Note: Answer all questions from Part-A and answer any five questions from Part-B.

PART – A (25 Marks)

1 Form a partial differential equation by eliminating arbitrary constants a and b from $(x - a)^2 + (y - b)^2 + z^2 = 1$ (2)

2 Find the complete integral of $pq(px + qy - z) = 1$. (3)

3 Find the values of a, b, c, d such that the function $f(z)=x^2 + axy + by^2 + i(cx^2 + dxy + y^2)$ is analytic. (2)

4 Evaluate $\oint_c z^2 dz$, where C if $|z - 2| = 1$. (3)

5 Find the zeros and singularities of f(z) = tan z. (2)

6 Determine whether the function of $f(z) = \bar{Z}$ is conformal. (3)

7 Derive iterative formula to find $N^{1/n}$ where N > 0 and n is a positive integer, using Newton-Raphson method. (2)

8 Find the Lagrange interpolating polynomial that fits the following data: (3)

x	0	1	2
f(x)	2	1	12

9 Define correlation and regression. (2)

10 If θ is the angle between two regression lines, standard deviation of Y is twice the standard deviation of X and r = 0.25, find tan θ. (3)

PART – B (50 Marks)

11 (a) Solve $y^2p - xy\,q = x(z - 2y)$. (5)

(b) Solve $2z + p^2 + qy + 2y^2 = 0$ by Charpit's method. (5)

12 (a) Show that $f(z) = \frac{(\bar{z})^2}{z}, z \neq 0$, f(0)=0, satisfies Cauchy-Riemann equations at (0, 0) but not differentiable there. (5)

(b) Evaluate $\oint_C \frac{Z^3 + Z + 1}{Z^2 - 7Z + 2} dz$, where C is the ellipse $4x^2 + 9y^2 = 1$ using Cauchy's integral formula. (5)

13 (a) Find the Laurent's series expansion of $f(z) = \frac{Z^2 - 1}{Z^2 + 5Z + 6}$ in the region $2 < |z| < 3$. (5)

(b) Use residue theorem to evaluate the integral $\int_{-\infty}^{\infty} \frac{\cos x}{(x^2+1)(x^2+4)} dx$. (5)

14 (a) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 0 from the following data: (5)

x	0	1	2	3	4	5
y	4	8	16	7	6	2

(b) Apply Euler's method to find the approximate value of y(0.3) if $\frac{dy}{dx} = x^2 + y^2$, y(0)=1, taking h = 0.1. (5)

15 (a) Calculate the coefficient of correlation between X and Y for the following data: (5)

X	1	2	3	4	5	6	7
Y	3	4	5	3	8	6	7

(b) Fit a curve of the form f(x)= ae^{bx} to the data : (5)

x	0.5	1	2	2.5	3
f(x)	0.57	1.46	5.10	7.65	9.20

16 (a) Solve $x^2p^2 + y^2q^2 = z^2$. (5)

(b) Obtain Cauchy – Riemann equations in polar form. (5)

17 (a) Find the image of the region x ≥ 2 under the mapping $\mu = \frac{4z+1}{z-2-i}$. (5)

(b) Perform the first three approximations of bisection method to solve xe^x -1= 0. (5)

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Code No. 5045 / O

FACULTY OF INFORMATICS

B.E. 2/4 (IT) I - Semester (Old) Examination, December 2015

Subject : Discrete Mathematics

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1 Define proposition. Construct truth table for $P \rightarrow (Q \rightarrow R)$. 3

2 Define quantifier. Show that $(\forall x)(P(x)) \rightarrow (\exists x)(P(x))$ is a logically valid statement. 3

3 Define equivalence relation. If {{1, 2, 3}, {2, 4}} is a partition set of the set A = {1, 2, 3, 4, 5}. Determine the corresponding relation. 3

4 How many 3 digit numbers can be formed using the digits 5, 7, 9, 1, if
a) a digit cannot appear more than once in a number.
b) any digit may appear any number of times in number. 3

5 What is the co-efficient of x^3y^7 in the binomial expansion of $(2x – 9y)^{10}$. 3

6 A single card is drawn from an ordinary deck of 52 cards. Find the probability that card is a) King b) Face card (Jack, queen or king) c) Heart 2

7 Define digraph and isolated graph. 2

8 Is there exists a graph G corresponding to following incidence matrix? Justify 2

$$I(G) = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

9 Explain the what is meant for a function to be 0(1). 2

10 Write the following in symbolic form. 2
a) “All men are good”
b) “No men are good”

PART – B (50 Marks)

11 a) Construct the truth table for 5
$(P \wedge (Q \wedge R)) \wedge \neg ((P \vee Q) \wedge (R \vee S)$
b) Show that the following statements are logically equivalent without using truth table $(P \rightarrow Q) \Leftrightarrow (\neg P \vee Q)$. 5

..2

12 a) Obtain the principal conjunctive normal form of the formula$(\neg P \rightarrow R) \wedge (Q \rightleftharpoons P)$. 5

b) Verify the validity of the following argument.
All integers are rational numbers some integers are powers of 3
Therefore some rational numbers are powers of 3. 5

13 a) Show that $3n^5 + 5n^3 + 7$ is divisible by 15 for each positive integer n by the principle of Mathematical induction. 5

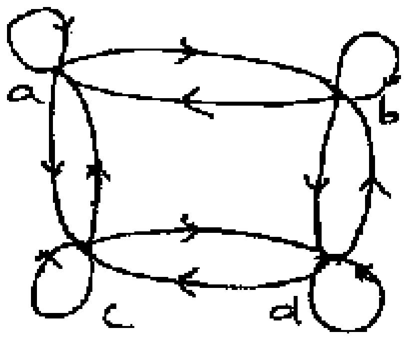
b) Show that $f(x) = x^2 + 2x + 1$ is $0(x^2)$. 5

14 a) Let the compatibility relation on set $\{x, x_2, x_3, x_4, x_5, x_6\}$ be given by the matrix. 5

x_2	1				
x_3	1	1			
x_4	0	0	1		
x_5	0	0	1	1	
x_6	1	0	1	0	1
	x_1	x_2	x_3	x_4	x_5

Draw the graph and find the maximum compatibility block of the relation.

b) Determine whether the relation with the directed graph shown is equivalence relation.



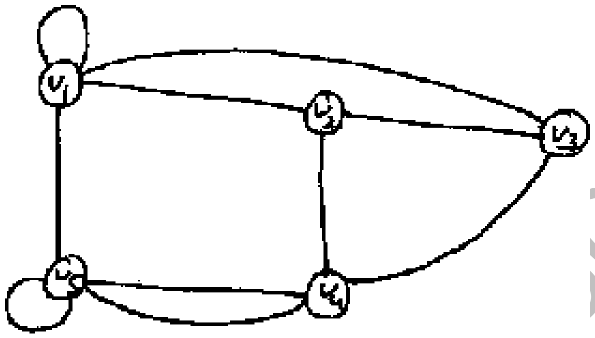
Justify your answer. 5

15 a) Solve $a_n - 3a_{n-1} + 2a_{n-2} = n^2 + 1$. 5

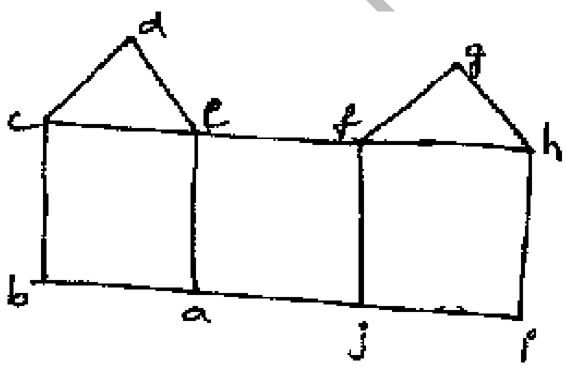
b) Find the number of combinations of the four objects a, b, c, d taken 3 at a time. 5

16 a) Find the number of positive integers between 100 and 999 inclusive are not divisible by 3 and 5. 5

b) Write incidence matrix and in degree, out degree of each vertex of the following graph. 5



17 a) Use Fleury's algorithm on the below graph to find an Euler circuit. 5



b) Write Kruskal's algorithm. 5

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Code No. 5078 / N

FACULTY OF INFORMATICS

B.E.2/4 (I.T.) I - Semester (New)(Main) Examination, December 2015

Subject : Discrete Mathematics

Time : 3 Hours **Max. Marks: 75**

Note: Answer all questions from Part-A and answer any five questions from Part-B.

PART – A (25 Marks)

1 How can this English sentence be translated into a logical expression?
"You can access the Internet from campus only if you are a computer science major or you are not a freshman." (2)

2 Write the truth table for implication $p \rightarrow q$. (2)

3 Define tautology, Contradiction and Contingency with an example. (3)

4 Define cardinality of a set with an example. (2)

5 Let f and g be the functions from the set of integers to the set of integers defined by $f(x) = 2x + 3$ and $g(x) = 3x + 2$. What is the composition of f and g? What is the composition of g and f ? (3)

6 Find the octal expansion of $(12345)_{10}$ (3)

7 What is the conditional probability that a family with two children has two boys, given they have at least one boy? Assume that each of the possibilities BB, BG, GB, and GG is equally likely, where B represents a boy and G represents a girl. (3)

8 How many relations are there on a set with n elements? (2)

9 Define Euler circuit and Hamilton circuit. (2)

10 What is the prefix form for $((x + y) \uparrow 2) + ((x - 4)/3)$? (3)

PART- B (50 Marks)

11 (a) Show that $p \rightarrow q$ and $\neg p \vee q$ are logically equivalent. (5)
(b) Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology. (5)

12 (a) Give a direct proof of the theorem "If n is an odd integer, then n^2 is odd." (6)
(b) The bit strings for the sets {1, 2, 3, 4, 5} and {1, 3, 5, 7, 9} are 11 1110 0000 and 10 1010 1010, respectively. Use bit strings to find the union and intersection of these sets. (4)

13 (a) Find the greatest common divisor of 45 and 34 using the Euclidean algorithm. (5)
(b) How many bit strings of length eight either start with a 1 bit or end with the two bits 00? (5)

14 (a) How many different strings can be made by reordering the letters of the word SUCCESS? (6)
(b) Let X be the number that comes up when a fair die is rolled. What is the expected value of X? (4)

15 (a) What is the solution of the recurrence relation $a_n = a_{n-1} + 2\, a_{n-2}$ with $a_0 = 2$ and $a_1 = 7$? (6)
(b) Find the number of solutions of $e_1 + e_2 + e_3 = 17$, where e_1, e_2, and e_3 are nonnegative integers with $2 \le e_1 \le 5$, $3 \le e_2 \le 6$, and $4 \le e_3 \le 7$. (4)

16 (a) Draw the Hasse diagram representing the partial ordering {(a, b)|a divides b} on {1, 2, 3, 4, 6, 8, 12}. (6)
(b) Determine whether $(P(S), \subseteq)$ is a lattice where S is a set. (4)

17 (a) Prove that an undirected graph has an even number of vertices of odd degree. (5)
(b) Explain Prim's algorithm to find a minimum spanning tree with an example. (5)

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