Code No. 3009

FACULTY OF ENGINEERING

B.E. 2/4 I-Semester (Main) Examination, November 2016

Subject : Mathematics – III (Common to All Except I.T. and 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 Eliminate the arbitrary function to obtain a partial differential equation from $z = xy + f(x^2 - y^2)$. 3

2 Solve $p^2 x(1+y^2) = qy$. 2

3 Find the Fourier half range sine series of the function $f(x) = x+x^2$, $0 < x < 1$. 3

4 Solve $3\frac{\partial u}{\partial x} + 2\frac{\partial u}{\partial y} = 0,\ u(x,0) = 4\,e^{-x}$. 2

5 If P(A) = 0.4, P(B) = 0.6, P(A/B) = 0.5 then find P(B/A) and $P(A \cup B)$. 3

6 A continuous random variable X has the probability density function 2

$$f(x) = \begin{cases} a + bx, & 0 \le x \le 1 \\ 0 & \text{otherwise} \end{cases}$$

If the mean of the distribution is $\frac{1}{3}$, find the values of a and b.

7 If X is a Poisson variate such that 3
P(X = 2) = 3P(X = 4) + 45P(X =6), then find the mean of X.

8 Define χ^2 distribution and find its mean. 2

9 Write normal equations to fit a straight line y = a + bx. 3

10 Two random variables have the regression lines with equations 3x + 2y = 26 and 6x + y = 31. Find the mean values $\bar{x}$ and $\bar{y}$. 2

PART – B (50 Marks)

11 a) Find the general solution of the partial differential equation $2xzp + 2yzq = z^2 - x^2 - y^2$. 5

b) Find the complete integral of $(p^2 + q^2)x = pz$ by Charpit's method. 5

..2

12 Find the Fourier series of the function 10

$$f(x) = \begin{cases} 0 & \text{if } -\overline{\wedge}, x < 0 \\ x^2 & \text{if } 0 \le x, \overline{\wedge} \end{cases}$$

and hence show that $\frac{\text{®}^2}{6} = 1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \ldots\ldots$

13 Solve the wave equation $\frac{\partial^2 u}{\partial t^2} = C^2 \frac{\partial^2 u}{\partial x^2}, 0 < x < \ell.$ $u(0,t) = u(\ell,t) = 0,$

$u(x,0) = x(\ell - x),\ \frac{\partial u}{\partial t}(x,0) = 0.$ 10

14 Find the moment generating function of a random variable with pdf $f(x) = \frac{1}{c} e^{-\frac{x}{c}}, 0 \le x < \infty, c > 0.$ Hence find its mean and standard deviation. 10

15 If X is a normal variate with mean 30 and S.D. 5, then find the probabilities that 10

i) $26 \le x \le 40$ ii) $x \ge 45$ iii) $|x - 30| > 5$

($P(0 \le z \le 0.8) = 0.2881$; $P(0 \le z \le 2) = 0.4772$ $P(0 \le z \le 1) = 0.3413$).

16 a) Two independent samples of size 7 and 6 have the following values : 5

Sample A	28	30	32	33	33	29	34
Sample B	29	30	30	24	27	29	-

Examine whether the samples have been drawn from normal populations having the same variance
(Given that value of F at 5% level for (6, 5) d.f is 4.95 and for (5, 6) d.f is 4.39).

b) Find the mean of Gamma distribution. 5

17 a) Fit a parabola $y = a + bx + cx^2$ to the following data :

X	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

b) If θ is the angle between the two regression lines, then show that 5

$$\tan\theta = \frac{1 - r^2}{r} \frac{\pm_x \pm_y}{\pm_x^2 + \pm_y^2}$$

Explain the significance when $r \pm 1$.

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Code No. 3023

FACULTY OF ENGINEERING

B.E. 2/4 (ECE) I - Semester (Main) Examination, November / December 2016

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 Find a partial differential equation by eliminating the arbitrary function f from $z = f(\sin x + \cos y)$. (3)

2 Solve $p - q = z \sin(x+y)$. (2)

3 Determine $\lim_{z\to 0} \frac{\bar{z}}{z}$, if it exists. (3)

4 Evaluate $\int_c \frac{2z+7}{(z^2+1)(z-9)} dz$ where C is $|z| = \frac{1}{2}$. (2)

5 If z = a is a simple pole of f(z), prove that the residue of f(z) at z = a is $\lim_{z\to a}(z-a)f(z)$. (3)

6 Find the image of the region $|z| > 1$ under the transformation $w = \frac{i}{z-i}$. (2)

7 Explain Newton-Raphson method. (3)

8 Find the approximate value of y(0.1) for $y' = 1 + y^2$, y(0) =1 by Euler's method. (2)

9 Find the normal equations to fit a quadratic curve $y = a + bx + cx^2$ for the data. (3)

x	0	1‘	2	3	4
y	1	1.8	1.3	2.5	6.3

10 If one of the regression coefficients is greater than 1, show that the other regression coefficient is less than 1. (2)

PART – B (50 Marks)

11 (a) Solve $x(y^2 - z^2)p + y(z^2 - x^2)q - z(x^2 - y^2) = 0$. (5)

(b) Reduce the equation $z^2 = pqxy$ to the form F(p. q) = 0 and hence solve it. (5)

12 (a) Show that $u(x, y) = 2x + y^3 - 3x^2y$ is harmonic and find its conjugate harmonic function. (5)

(b) State Cauchy's integral formula and use it to evaluate $\oint_c \frac{e^z}{z^2+1}$ where C is $|z - i| = 1$. (5)

13 (a) Find the Laurent series expansion of $f(z) = \frac{z}{(z-1)(z-3)}$ in the region $0 < |z - 1| < 2$. (5)

(b) Evaluate $\int_0^\infty \frac{x^2}{(x^2+9)(x^2+4)^2} dx$. (5)

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14 (a) Use Lagrange's interpolation formula to find f(10) from the following data. (5)

x	5	6	0	11
f(x)	12	13	14	16

(b) Compute $f^{11}(1.5)$ by Newton's backward formula for the following data: (5)

x	1	1.2	1.4	1.6
f(x)	1.01	1.18	1.33	1.56

15 (a) Fit a curve of the form $y = ae^{bx}$ to the following data: (5)

x	0.5	1.0	2.0	2.5	3.0
y	0.57	1.46	5.10	7.65	9.20

(b) The ranks of 10 students in two subjects A and B are as follows: (5)

A:	3	5	8	4	7	10	2	1	6	9
B:	6	4	9	8	1	2	3	10	5	7

Find the rank correlation coefficient.

16 (a) Solve $p^2 + q^2 = 1$ by Chapit's method. (5)

(b) Evaluate $\int_0^{4+2i} \bar{z}\, dz$ along the curve $z = t^2 + it$. (5)

17 (a) Find the bilinear transformation which maps the points 0, - i, -1 of the z-plane into the points i, 1, 0 of the w-plane respectively. (5)

(b) Find the regression line of x on y for the following data: (5)

x	1	5	3	2	1	1	7	3
y	6	1	0	0	1	2	1	5

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Code No. 3039

FACULTY OF INFORMATION

B.E. 2/4 (IT) I - Semester (Main) Examination, November / December 2016

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 Translate the following English sentence into a logical expression:
"You cannot ride the roller coaster if you are under 4 feet tall unless you are older than 16 years old". [2]

2 Write the Converse, Inverse and Contra positive of the following implication:
"A positive integer is a prime only if it has no divisors other than 1 and itself". [3]

3 State Sum Rule. [2]

4 Seven women and nine men are on the faculty in the Mathematics department of a college. How many ways are there to select a committee of 5 members of the department if atleast one woman and atleast one man must be on the committee?[3]

5 Define Conditional Probability. [2]

6 State the Principle of Inclusion-Exclusion. [3]

7 How many relations are there on a set with 'n' elements? [2]

8 Define chromatic number of a graph. What is the chromatic number of K_n? [3]

9 Define Strongly and Weakly connected graphs. [2]

10 What is the prefix form of the expression $[(x+2)\uparrow 3] * [y - (3 + x)] - 5$. [3]

PART- B (50 Marks)

11 (a) Show that the following compound proposition is a tautology. [5]

$$[(p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow r)] \rightarrow r$$

(b) Show that $7(p \leftrightarrow q)$ and $7p \leftrightarrow q$ are logically equivalent. [5]

12 (a) Prove that $\sqrt{2}$ is irrational by giving a proof by contradiction. [5]

(b) If 'n' is a positive integer then prove that $\sum_{k=0}^{\infty} C(n,k) = 2^n$. [5]

13 (a) Find the variance and standard deviation of the random variable 'X' whose value when two dice are rolled is X[(I, j)] = i+j, where 'i' is the number appearing on the first die and 'j' is the number appearing on the second die. [5]

(b) Find the solution of the Recurrence Relation $a_n - 6a_{n-1} + 9a_{n-2} = n.3^n$. [5]

14 (a) If 'm is a positive integer >1 then show that the relation $R=\{(a, b)/a \cong b(\text{mod } m)\}$ is an equivalence relation on the set of integers. [5]

(b) State and prove Euler's formula on planar graphs. [5]

15 (a) If 'G' is a connected planar simple graph with 'e' edges and 'v' vertices, show that $e \leq 3v - 6$. [5]

(b) Explain Depth First Search algorithm to find a spanning tree with an example. [5]

16 (a) If 'X' is a random variable on a sample space 'S' then prove that $V(X) = E(X^2) - [E(X)]^2$. [5]

(b) Find the coefficient of X^{10} in $(X^3 + X^4 + X^5 + \ldots\ldots)^3$. [5]

17 (a) The bit strings for the sets {1,2,3,4,5} & {1,3,5,7,9} are 1111100000 & 1010101010 respectively. Use bit strings to find union and intersection of these sets. [5]

b) Prove that a tree with 'n' vertices has exactly (n-1) edges. [5]

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