This question paper contains 3 printed pages.

Roll No. ......247296......

B.C.A. (Part-I)

132

Bas. Math.

B.C.A. (Part-I) EXAMINATION, 2019

(Faculty of Science)

(Three-Year Scheme of 10+2+3 Pattern)

100210

BASIC MATHEMATICS - 132

Time Allowed : Three Hours

Maximum Marks : 100

Answer of all the questions (short answer as well as descriptive) are to be given in the main answer-book only. Answers of short answer type questions must be given in sequential order. Similarly all the parts of one question of descriptive part should be answered at one place in the answer-book. One complete question should not be answered at different places in the answer - book.

Write your roll number on question paper before start writing answers of questions.

PART - I : (Very Short Answer) consists of 10 questions of 2 marks each. Maximum limit for each question is up to 40 words.

PART - II : (Short answer) consists of 5 questions of 4 marks each. Maximum limit for each question is up to 80 words.

PART - III : (Long answer) consists of 5 questions of 12 marks each with internal choice.

PART - I

1. Very short answers type questions.

(a) Find the domain of the function $\frac{|x|}{x}$.

(b) If $f : \mathbf{R} \to \mathbf{R}$, where $f(x) = x^2$, for all $x \in \mathbf{R}$ then find $f^{-1}(9)$.

(c) If $A+B = \begin{bmatrix} 5 & 2 \\ 0 & 1 \end{bmatrix}$ and $A-B = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$, then find A and B.

(d) If $A = \begin{bmatrix} 2 & 4 & -3 \\ 1 & -2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 1 \\ 4 & -2 \\ 3 & 0 \end{bmatrix}$, then find $(AB)^T$.

(e) If $y = m_1x + C_1$ and $y = m_2x + C_2$ are two straight lines such that $m_1 \cdot m_2 = -1$, find the relation between these lines.

(f) Solve the equation $x^2 - 2x - 8 = 0$.

(g) Find the mode of the following data :

16, 19, 19, 20, 15, 19, 20, 21, 24, 19, 16, 22, 16, 18, 20, 16, 19.

(h) Define mean square deviation.

(i) Write down the relation between ${}^nP_r$ and ${}^nC_r$.

(j) Find the probability that there are 53 Sundays in a year.

PART - II

2. Attempt all the parts :

(a) Prove that the identity function I_x on the non empty set X is a one-one onto function.

(b) If $A = \begin{bmatrix} 1 & 2 & 3 \\ -4 & 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 0 & 5 \\ -1 & -3 \end{bmatrix}$, then find AB and BA.

(c) Show that the points (2, 5), (4, 6) and (8, 8) are Collinear.

(d) Calculate the mean for the following data :

Class :	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45
Frequency :	5	6	15	10	5	4	2	2

(e) How many Committees consisting of 4 persons including a given Chairperson can be formed from a group of 10 persons ?

PART - III

Attempt **all** the following questions by taking **any two** parts from each question :

3. (a) If $f : \mathbf{R} \to \mathbf{R}$ and $g : \mathbf{R} \to \mathbf{R}$ are the functions, where $f(x) = 2x + 3$ and $g(x) = x^2 - 1$, for all $x \in \mathbf{R}$, then find $(f+g)(x)$, $(f.g)(x)$, $(f+g)(-3)$ and $(f.g)(5)$.

(b) Show that the function $f : \mathbf{R} - \{3\} \to \mathbf{R} - \{1\}$, where $f(x) = \dfrac{x-2}{x-3}$, for all $x \in \mathbf{R} - \{3\}$ is a bijection.

(c) If $f : \mathbf{R} \to \mathbf{R}$ and $g : \mathbf{R} \to \mathbf{R}$ are two functions such that $(gof)(x) = \sin^2 x$ and $(fog)(x) = \sin x^2$, for all $x \in \mathbf{R}$, then find f and g.

4. (a) Evaluate the determinant $\Delta = \begin{vmatrix} x & a & a \\ a & x & a \\ a & a & x \end{vmatrix}$.

(b) Find the inverse of the matrix $A = \begin{vmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{vmatrix}$.

(c) Solve the following system of linear equations by Camer's rule

$x + y + z = 7$, $x + 2y + 3z = 16$, $x + 3y + 4z = 22$.

5. (a) Find the equation of the straight line perpendicular to the line $5x - 2y = 8$ and passing through the point of intersection of the lines $4x + y - 1 = 0$ and $7x - 3y - 35 = 0$.

(b) Find the equation to the circle whose one of the diameter is the line segment joining the centres of the circles $x^2 + y^2 + 6x - 14y - 1 = 0$ and $x^2 + y^2 - 4x + 10y - 2 = 0$.

(c) For what value of k, the equation $(4 - k)x^2 + 2(k + 2)x + (8k - 1) = 0$ will have equal roots ?

6. (a) Calculate the median for the following cumulative frequency distribution :

Less than (x_i) :	20	30	40	50	60	70	80	90	100
Frequency (f_i) :	0	4	16	30	46	66	82	92	100

(b) Calculate the standard deviation for the following frequency distribution :

(x_i) :	5	15	25	35	45	55	65
(f_i) :	1	5	12	22	17	9	4

(c) Calculate the Coefficient of correlation for the following bivariate distribution :

(x_i) :	65	66	67	67	68	69	70	72
(y_i) :	67	68	65	68	72	72	69	71

7. (a) Find the probability of getting a total of atleast 6 in a simultaneous throw of three dice.

(b) One card is drawn from a well-shuffled pack of 52 cards. Find the probability that the card drawn is either red or a king.

(c) Two dice are thrown simultaneously. Find the probability that the total sum on the two faces is divisible by 3 or 4.

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This question paper contains 3 printed pages. Roll No. 260489

B.C.A. (Part-I) **Bas. Math.**

102

B.C.A. (Part-I) EXAMINATION, 2020 100424

(Faculty of Science)

(Three Year Scheme of 10+2+3 Pattern)

BASIC MATHEMATICS

Time Allowed : Three Hours Maximum Marks : 100

Answer of all the questions (short answer as well as descriptive) are to be given in the main answer-book only. Answers of short answer type questions must be given in sequential order. Similarly all the parts of one question of descriptive part should be answered at one place in the answer-book. One complete question should not be answered at different places in the answer-book.

Write your roll number on question paper before start writing answers of questions.

Part-I : *(Very short answer) consists of 10 questions of 2 marks each. Maximum limit for each question is upto 40 words.*

Part-II : *(Short answer) consists of 5 questions of 4 marks each. Maximum limit for each question is upto 80 words.*

Part-III : *(Long answer) consists of 5 questions of 12 marks each with internal choice.*

PART - I

1. Attempt all the Parts.

(a) Find the range of the function $f(x)=\frac{|x-3|}{x-3}$.

(b) If $f(x)=3x+1$, then find $f(f(x))$.

(c) If $A=[1\ 3\ 4]$, then find AA^T.

(d) If $\begin{bmatrix} x-2y & 3 \\ 5 & y \end{bmatrix}=\begin{bmatrix} 7 & 3 \\ 5 & -2 \end{bmatrix}$, then find x.

(e) Write the relation between the operators Δ and E.

(f) Find the nature of the roots of the equation $x^2-5x+6=0$.

(g) Find the arithmetic mean of the first 10 natural numbers.

(h) Write the formula for the mean deviation from mean.

(i) Find ${}^{n}P_{n-1}$

(j) Three numbers are chosen from 1 to 20. Find the probability that they are consecutive.

P.T.O.

PART - II

Attempt **all** the Parts.

2. (a) If $f(x) = ax + b$ and $g(x) = \frac{x-b}{a}$, for all $x \in R$, where $a \neq 0$, then find $(gof)(x)$ and $(fog)(x)$.

(b) If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then verify that $A^T A = I_2$.

(c) Find the ratio of the sum and the product of the roots of the equation $9x^2 + 6x - 8 = 0$.

(d) Calculate the median for the following data :

x_i :	5	6	7	8	9	10	11	12	13
f_i :	8	12	13	14	13	11	7	4	3

(e) Find the probability that in two throws of a die, six appears in both the throws.

PART - III

Attempt **all** the questions by taking **any two** parts from each question.

3. (a) If $f : R \to R$ and $g : R \to R$ are the function defined by $f(x) = x^2 + 1$ and $g(x) = \frac{x}{x+3}$, for all $x \in R$, then find gof and fog, if they do exist.

(b) If $f : Z \to Z$ is a function defined by $f(x) = 2x + 1$, for all $x \in Z$, then define the function $g : Z \to Z$ such that $gof \equiv I_z$.

(c) If $f : R \to R$, where $f(x) = 2x - 3$, for all $x \in R$, then prove that f is one-one and onto.

4. (a) Evaluate the determinant $\Delta = \begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$.

(b) Find the inverse of the matrix $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$.

(c) Use Cramer's rule to solve the following system of linear equations :
$x + 2y + 3z = 6$, $2x + 4y + z = 7$, $3x + 2y + 9z = 14$.

5. (a) Evaluate : $\left(\frac{\Delta^2}{E}\right)x^3$.

(b) For what value of k, the sum of the roots of the equation $3x^2 + (2k+1)x - (k+5) = 0$ is equal to the product of its roots ?

(c) If α, β are the roots of the equation $x^2 - 2x + 3 = 0$, then find the equation whose roots are $\alpha + 1$ and $\beta + 1$.

6. (a) Calculate the median for the following frequency distribution :

Class :	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
Frequency :	6	24	45	70	116	60	30	22	5

(b) Calculate the mean deviation from mean for the following distribution :

Marks :	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
No. of Students :	5	8	15	16	6

(c) Find the Coefficient of Correlation for the following bivariate data :

x_i :	1	2	3	4
y_i :	2	4	6	8

7. (a) Tickets are numbered from 1 to 25 and are mixed up together, one ticket is drawn randomly. Find the probability that the drawn ticket has the number a multiple of 3 or 5.

(b) Let A and B be two events, where $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{4}$ and $P(A \cap B) = \frac{1}{8}$. Find :

(i) $P(A \cup B)$ and

(ii) $P(\overline{A} \cap \overline{B})$

(c) Two cards are drawn one by one without replacement from a well shuffled pack of 52 cards. Find the probability that both cards are king.

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Basic Mathematics

B.C.A. (Part-I) Examination, 2017

[Time: Three Hours] [Maximum Marks: 100]

Part – I

1. Very Short Answer Type

a) Define Invertible function.

b) Define range of a function.

c) Define transpose of a matrix.

d) What difference between Eigen values and Eigen vectors.

e) Write standard equation of a circle.

f) Write Shridharacharya's formula.

g) Define Dispersion.

h) Write Relation between Mean, Mode, Median.

i) Define permutation.

j) Write Multiplication Law of probability.

Part – II

2. a) Prove that if $f: X \to Y$ and $g: Y \to Z$ are one-one function, then gof is also a one-one functions.

b) If $A = \begin{bmatrix} 1 & 3 & 2 \\ 4 & 2 & 5 \end{bmatrix}_{2\times3}$, $B = \begin{bmatrix} -1 & 0 & 3 \\ -2 & 5 & 1 \end{bmatrix}_{2\times3}$
find the matrix D such that A + 2B – D = 0.

c) Show that the point A(0, 1) , B(1, 4), C(4, 3) and D(3, 0) are the vertices of a square.

d) Calculate the median for the following frequency distribution.

xi	1	2	3	4	5	6	7	8	9
fi	8	10	11	16	20	25	15	9	6

e) Prove that

$$^nP_{n-1} = {^nP_n}.$$

Part – III

3. a) If $f : R \to R$ and $g : R \to R$ are the function where $f(x) = 2x + 3$ and $g(x) = x^2 - 1$ for all $x \in R$, then find $(f + g)(x)$, $(fg)(x)$, $(f+g)(-3)$ and $(fg)(5)$.

b) Define equal functions give an example of two functions that are equal.

OR

a) Show that the function $f : R \to R$, where $f(x) = x^3 + x$, for all $x \in R$ is a bijection.

b) If $f : R \to R$ where $f(x) = 2x - 3$ for all $x \in R$ then prove that f is bijective. Also find f^{-1}.

4. a) If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then verify that $A^T A = I_2$.

b) If $= \begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$, find $(A - 2I)(A - 3I)$.

OR

c) Prove that $\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix} = xyz(x - y)(y - z)(z - x)$.

d) Solve the following system of equations by Cramer's rule:

$$x + y + z = 11$$
$$2x - 6y - z = 0$$
$$3x - 4y - 2z = 0.$$

5. a) Find the Locus of a point such that the sum of its distances from the points (2, 0) and (-2, 0) is always 6.

b) Derive the slope – Intercept form of the equation of straight line.

OR

a) Derive the normal form of the equation of straight line.

b) Prove that the following straight lines are concurrent.

$3x - 5y - 11 = 0$, $5x + 3y - 7 = 0$, $x + 2y = 0$.

6. a) Calculate the mean and the standard deviation of first n natural numbers.

b) Calculate the mean, variance and standard deviation for the following frequency distribution:

Marks	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of students(fi)	3	6	13	15	14	5	4

OR

The following marks were obtained by class of students in Mathematics (out of 100). Compare the correlation coefficient for the above data. Find also the equations of the lines of regression.

Paper - I	45	55	56	58	60	65	68	70	75	80	85
Paper - II	56	50	48	60	62	64	65	70	74	82	90

7. a) Find the value of n if $^7P_n = 2.\ ^7P_{n-2}$.

b) Let A and B be two events such that $P(\bar{A}) = {}^2/_3$ and $(A \cup B) = \frac{1}{2}$. Find $P(\bar{A} \cap B)$.

OR

a) To prove that $C(n, r) = C(n-1, r-1) + C(n-1, r)$, where $0 < r < n$.

b) Find the probability of getting a total of at least 6 in a simultaneous throw of three dice.

This question paper contains 3 printed pages.

B.C.A.(Part - I) Roll No. 252557

000568

132 Bas. Math.

B.C.A. (Part - I) EXAMINATION - 2018

(Faculty of Science)

(Three - Year Scheme of 10 + 2 + 3 Pattern)

Paper - 132

BASIC MATHEMATICS

Time Allowed : Three Hours

Maximum Marks - 100

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PART - III: (Long answer) consists of 5 questions of 12 marks each with internal choice.

PART - I

1. Very Short Answers Type [10x2=20]

(a) Define one to one function.

(b) Define range of a function.

(c) Define an m x n matrix

(d) If $A=\begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $B=\begin{bmatrix} 0 & 1 & 2 \\ 2 & 1 & 0 \end{bmatrix}$; find AB

(e) Write an equation of straight line in the intercept form.

(f) Solve : $3x^2-5x+1=4x-5$

(g) Define standard deviation

(h) Define the line of regression of y on x.

(i) If ${}^nP_3 = 210$, find n.

(j) If two dice are thrown what is the probability that the sum is greater than 8.

PART - II

2. Attempt all the following parts: [5x4=20]

(a) Show that the function $f : R \to R$ defined by $f(x) = 3x^3 + 5$ for all $x \in R$ is a bijection.

(b) Find the value of the following determinant by without expansion:

$$\begin{vmatrix} 13 & 16 & 19 \\ 14 & 17 & 20 \\ 15 & 18 & 21 \end{vmatrix}$$

(c) Prove that the following points are vertices of a right angle triangle:

$(2, -2), (-2, 1)$ and $(5, 2)$

(d) Find the median of the following frequency distribution:

x :	1	2	3	4	5	6	7	8	9
f :	6	8	12	15	22	24	16	9	5

(e) In how many ways can 4 boys and 5 girls be seated in a row so that they are alternate?

PART - III

Attempt all the following five questions by taking any two parts from each question: [5x12=60]

3. (a) (i) Define Identity function and constant function with their graphs.

(ii) If $f : R \to R$ is a bijection such that $f(x) = 2x + 7$. Find the inverse of f.

(b) If $\phi(x) = \log\left(\frac{1-x}{1+x}\right)$, show that $\phi(x) + \phi(y) = \phi\left(\frac{x+y}{1+xy}\right)$

(c) Let the function $f : R \to R$ and $g : R \to R$ be defined by

$F(x) = 2x$, $g(x) = x^2 + 2$, $\forall x \in R$. Find fog(2) and gog(1).

4. (a) Find the inverse of the matrix

$$A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

(b) Solve the following equations by Cramer's rule:

$2x - y + 3z = 9$, $x + y + z = 6$ and $x - y + z = 2$

(c) Prove that :

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right)$$

5. (a) Find the equation of straight line which passes through the point (2,3) and parallel to the line joining the points (1,2) and (7,3).

(b) Find the equation of a circle passing through a point (3,-1) and having its centre at the point of intersection of the lines $4x+y+1 = 0$ and $2x-y+5=0$.

(c) Find a quadratic equation whose roots are reciprocal to the roots of the quadratic equation $ax^2+bx+c=0$

6. (a) Calculate the median for the following distribution :

Class - interval	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40
Frequency	20	24	32	28	20	16	37	18

(b) If each variate value be multiplied by a constant quantity a, then prove that the variance is multiplied by a^2

(c) Find the Karl Pearson's coefficient of correlation between the ages of husband and wife at the time of their marriage :

Age of Husband : x	23	27	28	28	29	30	31	33	35	36
Age of Wife : y	18	20	22	27	21	29	27	29	28	29

7. (a) The odds against a certain event are 5 to 2 and the odds in favour of another event are 6 to 5; if the events are independent, find the probability of the happening of at least one of them.

(b) Four persons are choose at random from a group of 3 men , 2 women and 4 children. Find the probability that the group has exactly two children.

(c) If ${}^{m+n}P_4 = 3024$ and ${}^{m-n}P_4 = 120$, find m and n.

This question paper contains 2 printed pages. Roll No. ....

B.C.A. (Pt. - II) **Disc. Math.**

202/232

B.C.A. (Part - II) EXAMINATION, 2021

(Faculty of Science)

(Three - Year Scheme of 10+2+3 Pattern)

DISCRETE MATHEMATICS

Time Allowed : Three Hours Maximum Marks : 100

No supplementary answer-book will be given to any candidate. Hence the candidates should write their answers precisely in the main answer-book only.

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Write your roll number on question paper before start writing answers of questions.

PART - I : *(Very short answer) consists of **10** questions of **2** marks each. Maximum limit for each question is upto **40** words.*

PART - II : *(Short answer) consists of **5** questions of **4** marks each. Maximum limit for each question is upto **80** words.*

PART - III : *(Long answer) consists of **5** questions of **12** marks each with internal choice.*

PART - I

Attempt **all** parts of the question.

1. (a) Let $a \equiv b \pmod{x}$ and y be any integer then show that $a - y \equiv b - y \pmod{x}$.
   (b) Expand $(1 + x)^5$ using Binomial theorem.
   (c) If $A \subseteq B$ then show that $A \oplus B = B - A$
   (d) Define equivalence relation.
   (e) Prove that $\sim(p \vee q) \Leftrightarrow \sim p \wedge \sim q$
   (f) Let $< B, +, \cdot, ', 0, 1 >$ be a Boolean algebra, then for all $a \in B$, prove that $a + a = a$.
   (g) Define simple graph.
   (h) Define product of two graphs.
   (i) Define Tree.
   (j) Define Spanning Tree.

PART - II

Attempt **all** the parts of the question.

2. (a) Solve $a_r = a_{r-1} + a_{r-2}$; $r \geq 2$, $a_0 = 0$, $a_1 = 1$.
   (b) If A, B, C and D are any four sets, then prove that $(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D)$
   (c) If p and q are two statements then show that $p \leftrightarrow q$ and $(p \wedge q) \vee (\sim p \wedge \sim q)$ are logically equivalent.
   (d) Prove that the numbers of edges in a simple graph with n vertices and k connected components $(k \geq 1)$ cannot exceed $\dfrac{(n-k)(n-k+1)}{2}$.
   (e) Prove that there is one and only path between every pair of distinct vertices in a tree.

PART - III

Attempt **all** questions by taking **any two** parts from each question.

3. (a) Prove that $6^{n+2} + 7^{2n+1}$ is divisible by 43 for each positive integer n.

(b) Find the Co-efficient x^r for the generating function $G(x) = \sum_{r=0}^{\infty} a_r x^r = \frac{x^2 - 5x + 3}{x^4 - 5x^2 + 4}$.

(c) Solve the recurrence relation $a_r - 6a_{r-1} + 9a_{r-2} = r \cdot 3^r$

4. (a) How many integers are there between 1 and 1000 which are not divisible by 2, 3, 5 or 7 ?

(b) Is the relation $R_1 = \{(a, b) | ab + 1 > 0 ; a, b \in R\}$ on the set R of real numbers, equivalence relation ? If not, explain.

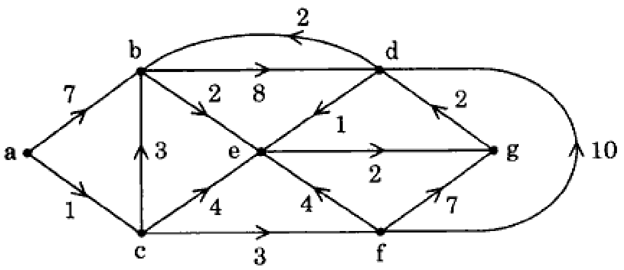
(c) Prove that the inverse of a one-one onto function is one-one, onto.

5. (a) Prove by means of truth table, that $p \rightarrow (q \wedge r) \Leftrightarrow (p \rightarrow q) \wedge (p \rightarrow r)$

(b) In the Boolean algebra $< B, +, \cdot, ', 0, 1 >$, $\forall a \in B$, prove that $(a')' = a$.

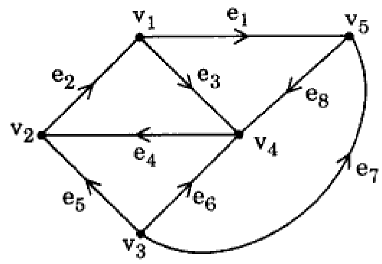
(c) Prove that, no Boolean Algebra can have exactly three distinct elements.

6. (a) Find the shortest path between the vertices a and g in the following directed weighted graph.



(b) If G is simple connected planer graph with n vertices and e edges (e > 2), then e ≤ 3n − 6.

(c) Find the adjacency matrix and the incidence matrix of the following directed graph.



7. (a) If T is binary tree with n vertices and of height h, then prove that $h + 1 \leq n \leq 2^{h+1} - 1$.

(b) Prove that a graph G is connected if and only if it has a spanning tree.

(c) Discuss Kruskal's algorithm to find a minimal spanning tree for a weighted connected graph.

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This question paper contains 4 printed pages] Roll No.

Sl.No.

232

B.C.A. (Part - II)

B.C.A. (Part - II) EXAMINATION, 2017

(Faculty of Science)

(Three - Year Scheme of 10+2+3 Pattern)

Paper-232

DISCRETE MATHEMATICS

Time : Three Hours] *[Maximum Marks : 100*

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Part I: ***(Very short answer) consists of 10 questions of 2 marks each. Maximum limit for each question is up to 40 words.***

Part II: ***(Short answer) consists of 5 questions of 4 marks each. Maximum limit for each question is up to 80 words.***

Part III: ***(Long answer) consists of 5 questions of 12 marks each with internal choice.***

PART-I

1. a) Convert following into decimal form

   i) $(110011)_2$

   ii) $(1101)_2$

   b) Convert the octal number 12.36 into binary form.

   c) Define complement of a set.

   d) Define partial order Relation.

   e) Make a truth table for the statement

   $(p \wedge q) \Rightarrow (p \vee q)$

   f) Define Regular graph and Bipartite graph.

g) Expand $\left(x+\frac{1}{x}\right)^6$ by binomial theorem.

h) If 'a' and 'b' are two element of Boolean Algebra then $(a.b)^1=a^1+b^1$.

i) Draw a graph having Hamiltonian circuit.

j) What is sub-tree.

PART-II

2. Convert following decimal into Binary.

   a) $(1024)_{10}$

   b) $(36.125)_{10}$

3. Find the terms independent of x in the expansions of $\left(3x^2+\frac{1}{3x}\right)^9$.

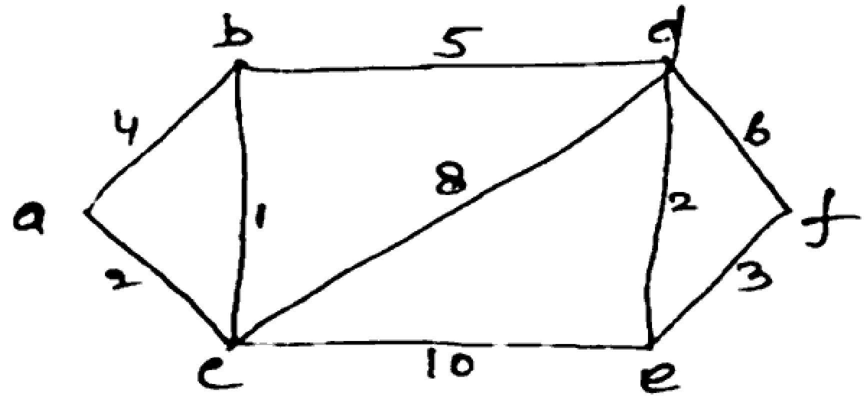
4. Prove that.

$$5+5^2+5^3+\ldots\ldots\ldots\ldots+5^n=\frac{5}{4}(5^n-1)$$

5. Find the following recurrence relation.

   $C_n=2C_{n-1}$ ˙ 1, n<1 and $C_1=1$

6. Find the shortest path between the vertices 'a' and 'f' in the following weighted graph.



PART-III

7. a) Compute the sum of-

   i) $(101101)_2 + (110011)_2$

   ii) $(11001)_2 + (11011)_2 + (11111)_2$

   b) Compute $(436)_{10} + (51)_{10} = (\quad)_2$

   c) Subtract the binary number 1010101 from 11100101.

OR

   a) Convert the number $(5AC)_{16}$ into binary form.

   b) Multiply $(11011)_2$ by $(111)_2$

   c) Find the middle term in the expansion of $\left(\frac{x}{2} - \frac{y}{3}\right)^8$

8. Prove that-

   a) $\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \ldots\ldots\ldots + \frac{1}{n(n+1)} = \frac{n}{n+1}$

   b) $5^{2n+2} - 24n - 25$, is divisible by 576 $\forall n \in N$.

OR

   a) Find the coefficient of x^3 in the expansion of the product $(1+2x)^6 (1-x)^7$.

   b) $(11)^{n+2} + (12)^{2n+1}$ is divisible by 133 $\forall n \in I$.

   c) By the principle of mathematical induction prove that

   $$7 + 77 + 777 + \ldots\ldots\ldots\ldots 777\ldots\ldots 7(\text{n digit}) = \frac{7}{81}(10^{n+1} - 9n - 10),\ n \in N.$$

9. a) Using property of set, Prove that-

   i) $A \cup (A \cap B) = A$

   ii) $A \cap (A \cup B) = A$

   b) Define

   i) one-one function

   ii) onto function

   c) If $f: R \to R$ is defined by $f(x) = 2x + 7$, find the inverse of f.

OR

   a) Prove that function $f: Q \to Q$ given by $f(x) = 2x - 3$ for all $x \in Q$ is a bijection.

b) On the set Q^* of positive rational, binary operation are defined as following

$$a*b=\frac{ab}{3}\ \forall\ a,b\in Q^*$$

Prove that the operation are commutative and Associative.

10. a) Show that the compound statement $(p\vee q)\wedge(\sim p\wedge\sim q)$ is a contraduction.

b) Construct a truth table for compound proposition $\sim p\to(q\to r)$.

OR

a) If p,q,r are any three statement, then show that $((p\vee q)\wedge(p\to r)\wedge(q\to r))\to r$ is a tautology.

b) If B be Boolean Algebra and a,b,$\in$ B then

i) a+a.b=a

ii) a.(a+b)=a

11. Define any three with example

a) Isomorphic Graph

b) Walk

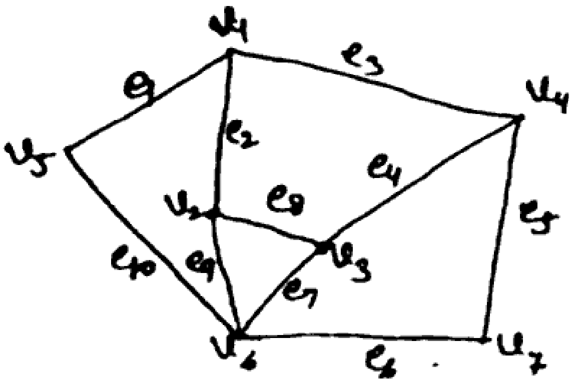
c) Hamiltonian Graph

d) Complete Binary tree

e) Complete Graph

OR

Incident Matrix and Adjacency Matrix of following Graph



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B.C.A. (Pt. II)

232

Disc. Math.

B.C.A. (PART II) EXAMINATION - 2018

(FACULTY OF SCIENCE)

(Three - Year Scheme of 10+2+3 Pattern)

Paper 232

DISCRETE MATHEMATICS

Time allowed : Three Hours

Maximum Marks : 100

Part I. (Very short answer) consists of 10 questions of 2 marks each. Maximum limit for each question is up to 40 words.

Part II: (Short answer) consists of 5 questions of 4 marks each. Maximum limit for each question is up to 80 words.

Part III - (Long answer) consists of 5 questions of 12 marks each with internal choice.

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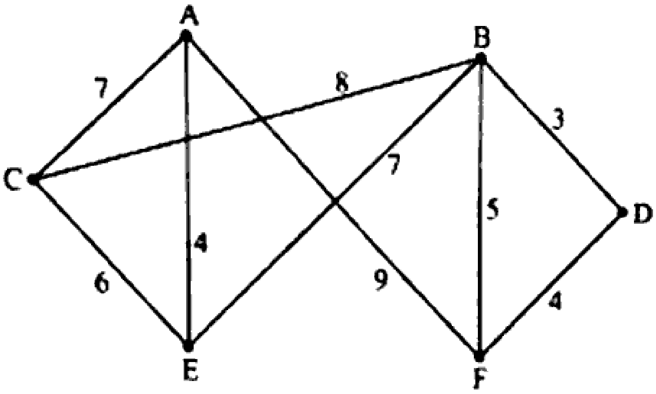
PART - I

1. Very Short Answer Type Questions
   (a) Convert the decimal number $(156)_{10}$ into binary form.
   (b) Compute the sum $(11011)_2 + (10011)_2$ into decimal form.
   (c) Define union of two sets.
   (d) Define equivalence relation.
   (e) By using truth table, for two statements p and q in usual notations show that $p \vee (p \wedge q) \equiv p$
   (f) For all elements 'a' of Boolean Algebra show that $a + 1 = 1$.
   (g) Define degree of a vertex in graphs.
   (h) What do you mean by proper colouring and chromatic number of a graph.
   (i) Define rooted and binary trees.
   (j) Define minimal spanning tree.

PART - II

2. Find the coefficient of x^n in the expression $\dfrac{1}{(x-3)(x-2)^2}$
3. If A and B are any two sets, then prove that : $(A \cup B)' = A' \cap B'$
4. For any two statements p and q show that $(p \wedge q) \Rightarrow (p \vee q)$ is a tautology.
5. If in a graph $G = (V, E)$ there are n vertices and e edges then prove that in the complementary graph $\bar{G}$ the number of vertices will be $\dfrac{n(n-1)}{2} - e$.
6. Find the minimal spanning tree by Krushal's algorithm in the following graph:



PART - III

7. (a) Compute $(38)_{10}+(69)_{10}=(\ )_2$

(b) Compute $(11011)_2-(10011)_2=(\ )_{10}$

(c) Use mathematical induction to prove that the sum of the first n odd positive integers is n^2.

(d) Using generating function find the solution of the recurrence relation.

$a_r-5a_{r-1}+6a_{r-2}=0, r\geq 2, a_0=6, a_1=30.$

OR

(a) Compute $(11001)_2+(11101)_2=(\ )_2$

(b) Compute $(46)_{10}-(146)_{10}=(\ )_2$

(c) Using mathematical induction method prove that :

$$1^2+2^2+3^2+\ldots+n^2=\frac{n(n+1)(2n+1)}{6},\ (n\geq 1)$$

(d) Find the solution of the recurrence relation :

$a_r=3a_{r-1}+2^r,\ r\geq 1, a_0=1.$

8. (a) If A, B, C and D are anyfour sets, then prove that $(A\times B)\cap(C\times D)=(A\cap C)\times(B\cap D)$.

(b) If $f: Q\rightarrow Q,\ f(x)=2x$ and $g: Q\rightarrow Q,\ g(x)=x+2$ then verify $(gof)^{-1}=f^{-1}og^{-1}$.

OR

(e) For any three sets A, B and C, show that $A-(B\cup C)=(A-B)\cap(A-C)$.

(f) On the set of real numbers, a binary operation * is defined as

$a*b=a+b+ab$, show that this binary operation is commutative and associative.

9. (a) If p and q are two statements, then by preparing truth table show that the compound statements $p\Leftrightarrow q$ and $(p\wedge q)\vee(\sim p\wedge\sim q)$ are logically equivalent.

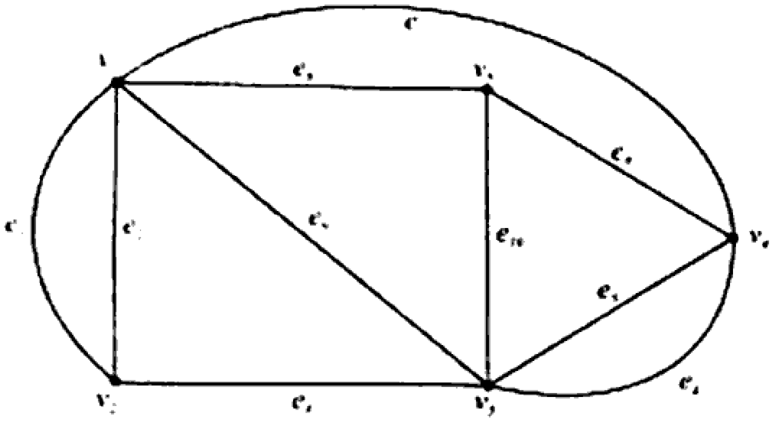
(b) What are the different methods of proving theorems. Prove that $\sqrt{2}$ is irrational number by giving a proof by contradiction.

OR

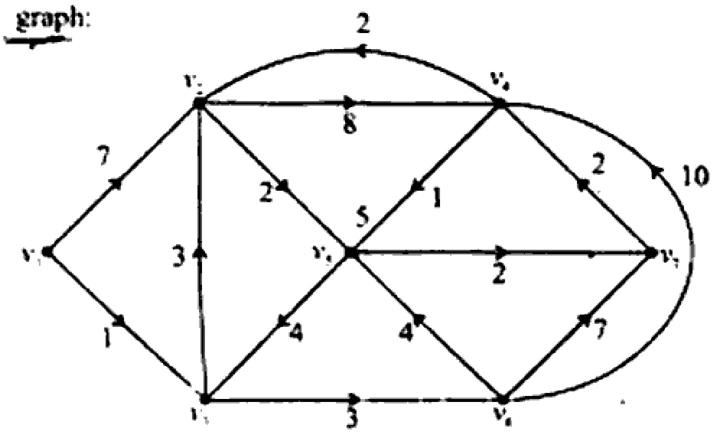
(a) Prove that no Boolean algebra can have exactly three distinct elments.

(b) If a, b, c are any three arbitrary elements of the Boolean algebra (B, +, ., ') such that $a+b=a+c$ and $a.b=a.c$ then prove that $b=c$.

10. (a) Find the incident matrix and adjacency matrix of the following graph:

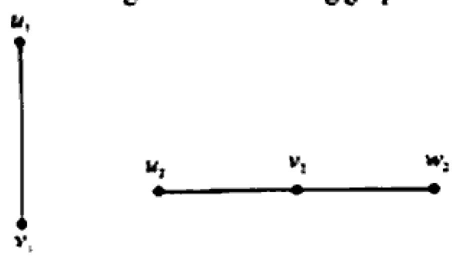


(b) Find the shortest path and shortest distance from the vertices v_1 to v_7 in the following weighted graph:



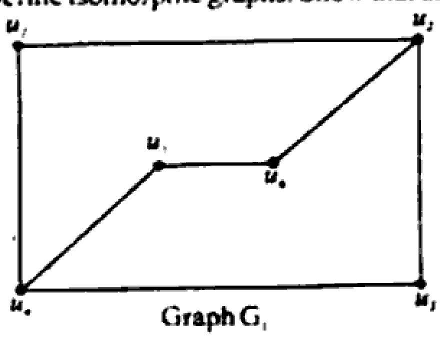
OR

(a) Find product $G_1 \times G_2$ and composition $G_1[G_2]$ of the following two graphs G_1 and G_2. Also write number of vertices and edges in the resulting graphs:

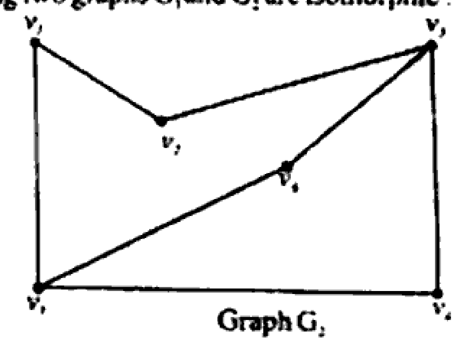


Graph G_1 Graph G_2

(b) Define isomorphic graphs. Show that the following two graphs G_1 and G_2 are isomorphic :

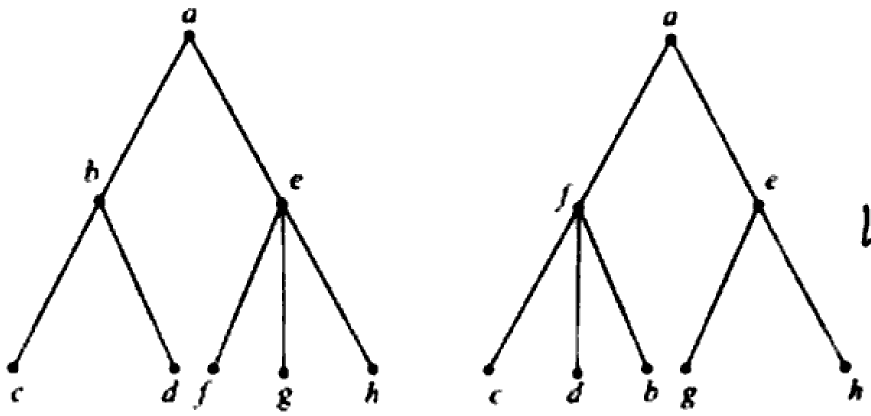


Graph G_1



Graph G_2

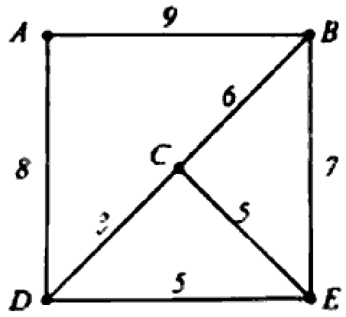
11. (a) What are the commonly used methods for tree traversal. Show that postorder traversals of the following two ordered rooted trees produce the same list of vertices :



Tree 1 Tree 2

LRT

(b) Find the minimal spanning tree from the following graph by Prim's method :



OR

(a) Define the following with example:

(i) Leaf of a tree

(ii) Tree traversal

(iii) Path length of a binary tree

(b) What is the ordered rooted tree that represents the expression $((a+b)\uparrow 2)+((a-4)/3)$. What is the value of the prefix expression $+ \; - \; * \; 2 \; 3 \; 5 \; / \uparrow 2 \; 3 \; 4$?