Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN											Course Code	2	3	M	C	A	1	1

First Semester MCA Degree Examinations, November 2024
MATHEMATICAL FOUNDATION FOR COMPUTER APPLICATIONS

Duration: 3 hrs **Max. Marks: 100**

Note: ***1. Answer any* FIVE *full questions, choosing* ONE *full question from each module.***
2. Use of Mathematics Formula Handbook is permitted.
3.Missing data, if any, may be suitably assumed

Q. No		Question	Marks	(RBTL:CO:PI)
		MODULE – 1		
1.	**a.**	Draw the Venn diagrams for the following. (i) $A \Delta B$ (ii) $\bar{A}$ (iii) $A-B$ (iv) $A \cap B$.	**06**	(2 :1: 1.2.1)
	b.	Let $A=\{1,2,3,4\}$ and let R be the relation on A defined by xRy if and only if "x divides y", written $x \mid y$.(a) Write down R as a set of ordered pairs (b) Draw the digraph of R.(c) Determine the in-degrees and out degrees of the vertices in the digraph	**07**	(2:1: 1.2.1)
	c.	Define the following relations with an example: (i) Reflexive (ii) Symmetric (iii) Transitive (iv) Equivalence.	**07**	(2 :1: 1.2.1)
		(OR)		
2.	**a.**	Consider the functions f and g defined by $f(x)=x^3$ and $g(x)=x^2+1, \forall x \in R$. Find gof, fog, $f^2$and g^2	**06**	(2 :1: 1.2.1)
	b.	Let $p=\begin{pmatrix}1&2&3&4&5&6\\4&3&5&1&2&6\end{pmatrix}$ be a permutation of the set $A=\{1,2,3,4,5,6\}$. (i) Write p as a product of disjoint cycles. (ii) Compute p^{-1} (iii) Compute p^2 and p^3	**07**	(2:1: 1.2.1)
	c.	**Given** $f(x)=\frac{(x+1)}{2}$, $g(x)=\frac{(x-1)}{2}$ $\forall x \in R$, **verify that** $(gof)^{-1}=f^{-1}og^{-1}$	**07**	(2 :1: 1.2.1)
		MODULE – 2		
3.	**a.**	Define proposition with an example. Draw truth table for $p \wedge q$, $p \vee q$, $p \rightarrow q$ and $p \leftrightarrow q$	**06**	(2 :2: 1.2.1)
	b.	Express the negations of the following statements using quantifiers and in English: (i) If the teacher is absent, then some students do not keep quiet. (ii) All the students keep quiet, and the teacher is present. (iii) Some of the students do not keep quiet or the teacher is absent.	**07**	(2:2: 1.2.1)
	c.	Show by indirect method of proof, $\forall x(p(x) \vee q(x)) \Rightarrow (\forall x\, p(x)) \vee (\exists x\, q(x))$.	**07**	(2 :2: 1.2.1)
		(OR)		
4.	**a.**	Write truth table for $(\neg(q \rightarrow r) \wedge r) \wedge (p \rightarrow q)$.	**06**	(2 :2: 1.2.1)
	b.	Show that $t \wedge s$ can be derived from the premises $p \rightarrow q$, $q \rightarrow \neg r$, r, and $p \vee (t \wedge s)$	**07**	(2:2: 1.2.1)

Note: (**RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI - Performance Indicator)**

c. Show that the following set of premises is inconsistent: "If Rama gets his degree, he will go for a job", "If he goes for a job, he will get married soon", "If he goes for higher study, he will not get married", "Rama gets his degree and goes for higher study". **07** (2 :2: 1.2.1)

MODULE – 3

5. a. Calculate the mean and standard deviation for the following data. **06** (2 :3: 1.2.1)

Marks	**90-99**	**80-89**	**70-79**	**60-69**	**50-59**	**40-49**	**30-39**
Number of students	**2**	**12**	**22**	**20**	**14**	**4**	**1**

b. The arithmetic mean of two observations is 127.5 and their geometric mean is 60. Find their harmonic mean, and the two observations? **07** (2:3: 1.2.1)

c. Find the value of mean, median, and mode from the data given below? **07** (2 :3: 1.2.1)

C. I.	93-97	98-102	103-107	108-112	113-117	118-122	123-127	128-132
f	**3**	**5**	**12**	**17**	**14**	**6**	**3**	**1**

(OR)

6. a. From the following data, Calculate (i) Quartile Q3 (ii) Decile D6 (iii) Percentile P40 **06** (2 :3: 1.2.1)

X	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**Total**
Y	**5**	**10**	**15**	**20**	**10**	**5**	**65**

b. Find the equation of the best fitting straight line for the following data and hence estimate the value of the dependent variable corresponding to the value 30 of the independent variable. **07** (2:3: 1.2.1)

x	**5**	**10**	**15**	**20**	**25**
y	**16**	**19**	**23**	**26**	**30**

c. From the data given below, find the two regression coefficients and the two regression equations? **07** (2 :3: 1.2.1)

X	**91**	**97**	**108**	**121**	**67**	**124**	**51**	**73**	**111**	**57**
Y	**71**	**75**	**69**	**97**	**70**	**91**	**39**	**61**	**80**	**47**

MODULE – 4

7. a. Find the value of k such that the following distribution represents finite probability distribution. Hence find its mean and standard deviation. also find $P(x \leq 1),\ P(x > 1),\ P(-1 < x \leq 2)$ **06** (2 :4: 1.2.1)

x	-3	-2	-1	0	1	2	3
$P(x)$	k	$2k$	$3k$	$4k$	$3k$	$2k$	k

b. The number of accidents in a year to taxi drivers in a city follows a Poisson distribution with mean 3. Out of 1000 taxi drivers find approximately the number of drivers with (i) no accidents in a year (ii) more than 3 accidents in year. **07** (2:4: 1.2.1)

c. When a coin is tossed 4 times, find the probability of getting (i) exactly one head (ii) at most 3 heads (iii) at least 2 heads. **07** (2 :4: 1.2.1)

(OR)

8. a. Evaluate the following probabilities with the help of normal probability tables. **06** (2 :4: 1.2.1)

$(i) P(z \geq 0.85) (ii) P(-1.64 \leq z \leq -0.88) (iii) P(|z| \leq 1.94)$

b. The length of telephone conversation in a booth has been an exponential distribution and found on an average to be 5 minutes. Find the probability that a random call made from this booth (i) ends less than 5 minutes (ii) between 5 and 10 minutes. **07** (2:4: 1.2.1)

Note: (**RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI - Performance Indicator)**

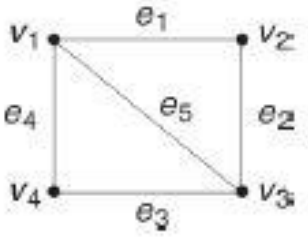
	c.	The marks of 1000 students in an examination follow a normal distribution with mean 70 and standard deviation 5. Find the number of students whose marks will be (i) less than 65 (ii) more than 75 (iii) between 65 to 75. [Given P(1)=0.3413]	**07**	(2 :4: 1.2.1)

MODULE – 5

9.	**a.**	Define with examples (i) simple graph (ii) complete graph (iii) Bipartite graph	**06**	(2 :5: 1.2.1)
	b.	Prove that the sum of the degrees of all the vertices of an undirected graph is twice the number of edges of the graph and hence even.	**07**	(2:5: 1.2.1)
	c.	Prove that, in every graph, the number of vertices of odd degrees is even.	**07**	(2 :5: 1.2.1)

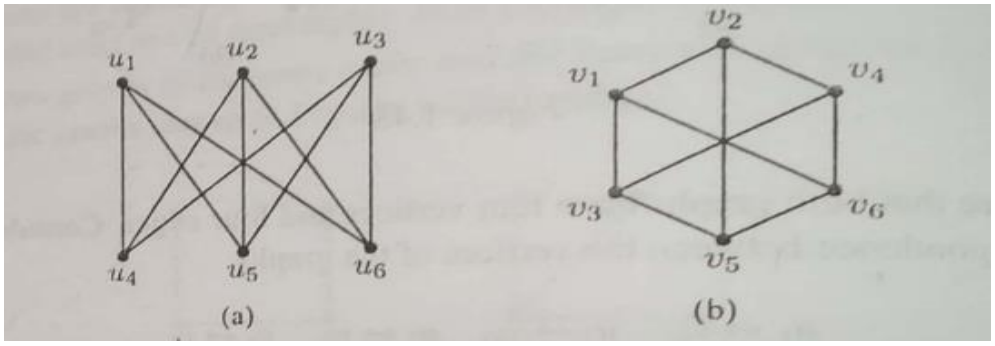
(OR)

10.	**a.**	For each of the following degree sequences, find if there exists a simple graph. In each case, either draw a graph or explain why no graphs exists. (i). 4, 4, 4, 3, 2 (ii). 5, 5, 4, 3, 2, 1 (iii). 3, 3, 3, 3, 2 (iv). 3, 3, 3, 3, 3, 3 (v). 8, 7, 7, 6, 4, 2, 1, 1	**06**	(2 :5: 1.2.1)
	b.	Write incidence matrix for the graph shown in Q. 10(b).	**07**	(2:5: 1.2.1)



Q. 10(b)

	c.	Define Isomorphosm. Also verify the two graphs shown in Q. 10(c) are isomorphc.	**07**	(2 :5: 1.2.1)



Q. 10(c)

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