S.D.E.

B.C.A. (2004 COURSE SEM- I : WINTER - 2017

SUBJECT : MATHEMATICAL FOUNDATIONS

Day : **Monday** Time : **10.00 AM TO 1.00 PM**

Date : **18/12/2017** **W-2017-4152** Max. Marks : 80

N.B.:

1) Attempt **ANY FIVE** questions from Section – I and **ANY TWO** questions from Section – II.
2) Answers to both the sections should be written in **SEPARATE** answer books.
3) Figures to the right indicate **FULL** marks.

SECTION – I

Q.1 If $A = \begin{bmatrix} 3 & 2 & 1 \\ 5 & 6 & 3 \\ -1 & 2 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 3 \\ 1 & 2 & 3 \end{bmatrix}$ then find: **[10]**

i) $A^2 + B^2$ **ii)** $(A + B)(A - B)$

Q.2 Prepare the truth table for the following logical statements: **[10]**

i) $(p \leftrightarrow q) \wedge (q \leftrightarrow r)$ ii) $(p \rightarrow \sim q) \wedge (\sim q \rightarrow \sim r)$

Q.3 Two unbiased dice are thrown simultaneously. Find the probability that the sum of the scores on the upper faces is: **[10]**

i) multiple of 3 ii) divisible by either 2 or 5.

Q.4 If $\bar{a} = 2\hat{i} - 2\hat{j} + 3\hat{k}$, $\bar{b} = 3\hat{i} + 4\hat{j} - 5\hat{k}$ then find: **[10]**

i) $3\bar{a} + 4\bar{b}$ **ii)** $3\bar{a} \times 4\bar{b}$

Q.5 If f, g, h are functions on X = {1, 2, 3} and defined as: **[10]**

f = {(1, 2), (2, 3), (3, 1)}, g = {(1, 2), (2, 1), (3, 3)}, h = {(1, 1), (2, 2), (3, 1)},

compute: **i)** fog **ii)** gof **iii)** foh **iv)** fogoh.

Q.6 Prove that ${}^{n+1}C_r = {}^{n}C_{r-1} + {}^{n}C_r$ **[10]**

Q.7 Write short notes on **ANY TWO** of the following: **[10]**

a) Recursively defined functions

b) Binomial distribution

c) Ordered and unordered partitions

SECTION – II

Q.8 Find the values of x, y and z by using matrix method if: **[15]**

$$\begin{bmatrix} 1 & 2 & -1 \\ 3 & 2 & 4 \\ 3 & 2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ -11 \\ 4 \end{bmatrix}$$

Q.9 In a class of 80 students,50 students know English, 55 know French and 46 know German language. 37 students know English and French.28 students know French and German and 7 students know none of the languages. Draw Venn diagram and answer the following : **[15]**

a) How many students know all the three languages?

b) How many students know exactly 2 languages?

c) How many students know only one language?

Q.10 **a)** Prove that $1 + 2 + 3 .... + n = \frac{n(n+1)}{2}$ by using induction method. **[08]**

b) Find the value of: **[07]**

i) $3 \log_2 8 + 4 \log_2 16 - 13 \log_2 32$ **ii)** $12 \log_3 27 - 3 \log_{27} 3 - 4 \log_3 81$

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