RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

SECOND YEAR B.A./B.SC. FOURTH SEMESTER (January – June) 2014 Mid-Semester Examination, March 2014

: 26/03/2014 Date

MATHEMATICS (General)

: 11 am – 12 noon Time

Paper : IV

Full Marks: 25

[Use a separate Answer Book for each group]

Group – A

Answer any one of the following : 1.

a) i) Examine the convergence of
$$\int_{1}^{\infty} \frac{dx}{x\sqrt{1+x^2}}$$
. [2]

ii) Evaluate
$$\lim_{n \to \infty} \sum_{r=1}^{n-1} \frac{1}{n} \sqrt{\frac{n+r}{n-r}}.$$
 [3]

b) i) Prove that
$$\int_{-1}^{1} \frac{1}{x^3} dx$$
 exists in the Cauchy principal value sense but not in the general sense. [2]

ii) Find the value of
$$\int_{0}^{\infty} \frac{dx}{(x^2 + a^2)(x^2 + b^2)}$$
, $a, b > 0.$ [3]

2. Answer any one :

Show that the volume of the solid generated by resolving the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ about the major axis a) is $\frac{4}{3}\pi ab^2$ and about the minor axis is $\frac{4}{2}\pi a^2b$.

b) Find the area of the surface of the solid generated by revolving one arch of the cycloid $x = \theta - \sin \theta$, $y = 1 - \cos \theta$ about x-axis.

Group – B

3. Answer **any one** question :

- a) i) Define the conditional probability of an event B on the hypothesis that another event A has occurred.
 - ii) In an examination 40% of the students passed in Mathematics, 15% passed in Chemistry and 10% passed in both Mathematics and Chemistry. A student is selected at random. If he has passed in Chemistry, what is the probability that— (i) he has failed in Mathematics (ii) he has passed in both Mathematics and Chemistry? [1+2+2]
- b) i) Define the condition for which two events A and B to be stochastically independent.
 - ii) Give an example to show that P(AB) = P(A)P(B), P(AC) = P(A)P(C), P(BC) = P(B)P(C) but $P(ABC) \neq P(A)P(BC)$ where A, B, C are events connected with an random experiment.
 - iii) Prove that $P(A_1 + A_2 + A_3) \le P(A_1) + P(A_2) + P(A_3)$ where A_1, A_2, A_3 are events. [1+2+2]

Answer any one question : 4.

The percentage of literacy in West Bengal is shown in the following table. Represent them in a Bar a) diagram :

Years —	1941	1951	1061	1971
Literacy (%) —	27.4	34.1	40.1	44.8

[1×2]

[1×5]

[1×5]

[1×5]

	b) Find the arithmetic mean of the age of persons, where the table is shown below :										
		Age	(in Years)	: 40-44	4 45 -	49 5	50 - 54	55 – 59	60 - 64		
		No. c	of persons	: 17	25		30	20	8		
5.	Ans	swer <u>any t</u>	<u>wo</u> questic	ons :							[2×4]
a) The expenditure of 100 families is given below :											
		Expe	nditure (R	s): 10-	- 10 10	0 - 20	20 - 30	30-40	40 -	50	
		No.	of familie	es: 1	4	?	27	?	15	5	
		Mode of t	he distribu	ition is 24.	Calculate	the mis	sing frequ	uencies.			
	b) Calculate the range and quartile deviation of the following distribution :										
		x :	4 6	i 8	10	12	14				
		f :	9 1	2 15	16	5	5				
	c) Find the standard deviation of the following :										
			Class :	10 – 19	20 - 29	30 -	- 39 4	0-49 5	0-59	60 - 69	
		Frequ	uency :	3	5	-	7	9	4	2	

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