

**2015****M.Sc.****2nd Semester Examination****MICROBIOLOGY****PAPER—MCB-203****Full Marks : 40****Time : 2 Hours**

*The figures in the right-hand margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

*Illustrate the answers wherever necessary.*

**Answer any two questions from each group.**

**Group — A****[Marks : 20]****Answer any all questions.****1. Answer any two questions :****2×3**

(a) Evaluate  $\lim_{x \rightarrow 2} \frac{x - \sqrt{3x - 2}}{x^2 - 4}$

(b) Evaluate  $\lim_{x \rightarrow \pi} \frac{1 + \cos x}{(x - \pi)^2}$

**(Turn Over)**

- (c) Let  $f(x) = x^2 + 1$  when,  $x > 1$   
 $= 2$  when,  $x = 1$   
 $= 2x$  when,  $x < 1$

Test whether  $f(x)$  is continuous at  $x=1$  or not.

2. Answer any *three* questions :

3×3

(a) Find  $\frac{dy}{dx}$ , when  $y = \frac{x \sin x + \cos x}{x \cos x - \sin x}$ .

(b) Find  $\frac{dy}{dx}$ , when  $y = \cot^{-1} \frac{b-ax}{a+bx}$ .

(c) Find  $\frac{dy}{dx}$ , when  $y = \sqrt{x} \sec x \tan x$ .

(d) Integrate  $\int \frac{dx}{1 - \sin x}$ .

(e) Integrate  $\int \frac{dx}{(2x-3)\sqrt{3x+2}}$ .

(f) Integrate  $\int \frac{dx}{\sqrt{ax+b} + \sqrt{ax-b}}$ .

3. Mathematical model of the bacterial growth curve for the first phase is given by

$$b(t) = 5000 t^2, \text{ where } t \text{ in hour}$$

Find the bacterial growth

(a) at  $t = 4$  hours

(b) between  $t = 2$  hours to  $t = 5$  hours.

**Group — B**

**[Marks : 20]**

Answer any *two* questions.

4. (a) What do you mean by random sampling with replacement and without replacement?  
 (b) A researcher during his experiments categorised the experimental rats as follows :

Weight (gm) :	51-53	54-56	57-59	60-62	63-65	66-68	69-71
No of rats :	5	7	14	28	15	8	3

Calculate the mean, median, standard deviation and variance from the set of data. 2+8

5. (a) Define null hypothesis and alternative hypothesis.  
 (b) Define correlation coefficient.  
 (c) Particulars regarding a test exam given below :

	Boys	Girls
No. of candidates appeared	16	16
Mean score	40.3	37.5
Standard deviation	8.15	6.35

Is there a significant difference between the mean score of boys and girls?

Given that  $t_{0.05}(30) = 2.042$

3+2+5

4. (a) What do you mean by normal distribution?  
 (b) What is one tail and two tail t-test?  
 (c) The achievement test score of 10 high school students before and after intensive practice are given below.

<i>Individuals</i>	<i>Before Practice</i>	<i>After Practice</i>
1	72	120
2	67	81
3	90	110
4	97	103
5	84	109
6	92	137
7	65	115
8	75	82
9	80	110
10	69	89

Does practice make a significant difference in achievement test score?

Given that  $t_{0.001} (9) = 4.781$

2+3+5