UG Odd Semester (CBCS) Exam., December—2016

PHARMACEUTICAL SCIENCE

(1st Semester)

Course No. : BPHCC–102

(Mathematics and Statistics)

(New Course)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. *(a)* Evaluate the following limits : 2×3=6

(i) $\underset{x \to 0}{\text{Lt}} \dfrac{1 - \cos x}{x^2}$

(ii) $\underset{x \to a}{\text{Lt}} \dfrac{\sqrt{x} - \sqrt{a}}{\sqrt[3]{x} - \sqrt[3]{a}}$

(iii) $\underset{x \to \infty}{\text{Lt}} \dfrac{3x^2 - 2x + 1}{4x^2 + 3x + 1}$

(b) If

$$y = e^{ax^2 + bx + c}$$

then find $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$. 4

(c) Find $\dfrac{dy}{dx}$, if $x = a(t - \sin t)$ and $y = a(1 - \cos t)$. 2+2=4

2. *(a)* If $y = 2x^5 - 3x^2 + 5x - 7$, then find $\dfrac{d^2y}{dx^2}$. 4

(b) If $y = \sin(ax + b)$, prove that

$$\dfrac{d^2y}{dx^2} + a^2 \dfrac{dy}{dx} = 0$$ 4

(c) Find $\dfrac{dy}{dx}$ for the following : 2+2=4

(i) $ax^2 + 2hxy + by^2 = 0$

(ii) $x^3 + y^3 = 3axy$

(d) Evaluate

$$\underset{n \to \infty}{\text{Lt}} \dfrac{1 + 2 + 3 + \cdots + n}{n^2}$$ 2

(3)

3. *(a)* Evaluate the following integrals :   3+3=6

   (i) $\dfrac{dx}{x^2 \; 4x \; 13}$

   (ii) $\dfrac{(4x \; 3)\,dx}{2x^2 \; x \; 1}$

(b) Find the differential equation whose general solution is $y \; a\cos x \; b\sin x$, where a and b are arbitrary constants.   3

(c) Evaluate :   2

$$\int_0^1 \dfrac{dx}{1 \; x^2}$$

(d) Solve :   3

$$\dfrac{d^2y}{dx^2} \; 6\dfrac{dy}{dx} \; 8y \; 0$$

4. *(a)* Find the differential equation by eliminating the constant c from the relation $y \; cx \; c^2$.   4

(b) Solve :   3+3=6

   (i) $\dfrac{dy}{dx} \; \dfrac{y \; 3}{x \; 2}$

   (ii) $\dfrac{dy}{dx} \; y\cos x \; 0$

(c) Evaluate the following :   2+2=4

   (i) $\int_0^{/2} \cos^2 x\,dx$

   (ii) $\int_1^4 \dfrac{dx}{\sqrt{5 \; x}}$

(4)

5. *(a)* Write one merit and demerit of mean.   2

(b) Find the median wage of the following distribution :   6

Wages	:	20–30	30–40	40–50	50–60	60–70
No. of labour	:	3	5	20	10	5

(c) Find variance and standard deviation for the following data :   6

Class	:	30–40	40–50	50–60	60–70	70–80	80–90	90–100
Frequency	:	3	7	12	15	8	3	2

6. *(a)* Write different measures of central tendency.   2

(b) Find the median for the following frequency distribution :   5

x	:	1	2	3	4	5	6	7	8	9
$f(x)$	:	8	10	11	16	20	25	15	9	6

(c) Find the mean deviation about the mean for the following data :   3

   6, 7, 10, 12, 13, 4, 8, 9

(d) Calculate the mean deviation about the median for the following data :   4

Class	:	0–10	10–20	20–30	30–40	40–50	50–60
Frequency	:	6	7	15	16	4	2

(5)

7. *(a)* Define classical definition of probability. Write its limitations.   2+2=4

(b) What is the chance that a leap year selected at random will contain 53 Sundays?   5

(c) Write down the application of bio-metrics in pharmaceutical sciences.   5

8. *(a)* A bag contains 3 red, 6 white and 7 blue balls. What is the probability that two balls drawn are white and blue?   6

(b) If the letters of word 'REGULATIONS' be arranged at random, what is the chance that there will be exactly 4 letters between R and E?   5

(c) Define Binomial distribution and Poisson distribution.   3

UNIT—V

9. *(a)* By using Laplace transform, solve the following equation :   6

$$\frac{dy}{dt} + 2y = e^{5t}, \; y(0) = 3$$

(b) If $L\{F(t)\} = F(s)$, then prove that

$$L\{t^n F(t)\} = (-1)^n \frac{d^n}{dx^n}\{F(s)\}$$ 5

(6)

(c) Find

$$L\{(t^2 - 3t - 2)\sin 3t\}$$ 3

10. *(a)* Find

$$L^{-1}\left[\frac{1}{s(s^2 - 1)}\right]$$ 5

(b) Let $F_1(s)$ and $F_2(s)$ be the Laplace transform of $f(t)$ and $g(t)$ respectively. Prove that

$$L\{C_1 f(t) - C_2 g(t)\} = C_1 F_1(s) - C_2 F_2(s)$$ 5

(c) State and prove shifting property in Laplace transform.   4

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