

09.06.15 (ASTU-2nd Sem)

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PY 1322010

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B. Pharm 2nd Semester End-Term Examination

MATHEMATICS AND STATISTICS

Full Marks – 100 Pass Marks – 35 Time – Three hours

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

1. For each of the following questions, four answers are provided of which one is correct. Choose the correct answer in each case. $2 \times 10 = 20$

(i) The solution of the differential equation $x dx + y dy = 0$ is

(a) $x^2 + y^2 = 2c$

(b) $y = x + c$

(c) $y = cx$

(d) None of these

[Turn over

(ii) The complimentary function (C.F) of the differential equation $\frac{d^2y}{dx^2} - 4y = \cos x$ is

(a) $C_1e^{2x} + C_2e^{-2x}$

(b) $C_1 \cos 2x + C_2 \sin 2x$

(c) $(C_1x + C_2) e^{2x}$

(d) None of these

(iii) The particular integral (P.I) of the differential equation $(D^2 + D - 6)y = 2$ is

(a) $-e^{2x}$

(b) e^{2x}

(c) $\frac{1}{-3}$

(d) None of these

(iv) The degree of the differential equation

$$\left(\frac{d^2y}{dx^2}\right)^4 - 3\left(\frac{dy}{dx}\right)^3 = 1 \text{ is}$$

(a) 4

(b) 3

(c) 2

(d) None of these

(v) The Laplace transform of e^{-3t} is

(a) $\frac{1}{s-3}$

(b) $\frac{2}{s^2}$

(c) $\frac{1}{s+3}$

(d) None of these

(vi) The probability of getting a sum of 10 in a single toss of a pair of unbiased dice is

(a) $\frac{1}{6}$

(b) $\frac{1}{12}$

(c) $\frac{1}{36}$

(d) None of these

(vii) If A and B are independent events, then

(a) $P(A \cap B) = P(A) \cdot P(B/A)$

(b) $P(A \cup B) = P(A) + P(B)$

(c) $P(A \cap B) = P(A) + P(B)$

(d) None of these

(viii) In a positively skewed distribution

(a) Mean $>$ Median $>$ Mode

(b) Mean $<$ Median $<$ Mode

(c) Mean = Median = Mode

(d) None of these

(ix) The Poisson distribution is a limiting case of binomial distribution under the condition

(a) $n \rightarrow 0, p \rightarrow \infty$

(b) $n \rightarrow \infty, p \rightarrow 0$

(c) $n \rightarrow 0, p \rightarrow 1$

(d) None of these

(x) The maximum value of correlation coefficient is

(a) 1

(b) -1

(c) 2

(d) None of these

2. Answer the following :

3×10=30

(i) Form the differential equation from

$$y = Ae^x + Be^{-x}$$

(ii) Solve $\frac{dy}{dx} - \frac{y}{x} = x$

(iii) Solve $(D^2 - 3D + 2) y = 0$.

(iv) Find the Laplace transform of $\cos 3t \sin 2t$.

(v) Find the inverse Laplace transform of

$$\frac{1}{(s-a)^3}$$

(vi) State Bayes theorem.

(vii) If A and B are two non-mutually exclusive events and if $P(A) = 1/4$, $P(B) = 2/5$, $P(A \cup B) = 1/2$, then find the value of $P(A \cap B)$.

(viii) What do you mean by dispersion and skewness ?

(ix) A can speak the truth in 60% cases and B can speak the truth in 70% cases. Find the probability that A and B contradicts on a statement.

(x) Define Binomial Distribution.

3. Answer the following :

5×10=50

(i) Solve $\frac{dy}{dx} = \frac{(x^2 + y^2)}{xy}$

(ii) Solve $(D^2 - 1)y = \sin x$

(iii) Solve

$$\frac{dx}{dt} - y = 1$$

$$\frac{dy}{dt} + x = e^t$$

(iv) Find the Laplace transform of $\frac{e^{at} - e^{bt}}{t}$

(v) Apply convolution theorem to find the inverse Laplace transform of

$$\frac{s}{(s^2 + a^2)(s^2 + b^2)}$$

Or

Solve the differential equation by Laplace transform method

$$\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + 2y = 0, \quad y(0) = 0, \quad y'(0) = 1$$

(vi) If the probability of a bad reaction from a certain injection is 0.001, determine the chance that out of 4000 individuals more than 4 will get a bad reaction.

(vii) Calculate the mean and standard deviation for the following frequency distribution :

Class	: 0-10	10-20	20-30	30-40
Frequency	; 5	8	9	6

Or

The marks obtained by 10 students in Mathematics and Pharmacognosy are as follows :

Marks in Mathematics	66	78	51	76	80
Marks in Pharmacognosy	71	69	54	68	72

Marks in Mathematics	55	72	56	43	42
Marks in Pharmacognosy	65	41	59	56	64

Calculate the coefficient of correlation.

(viii) For a certain distribution

$$n = 25, \sum x = 125, \sum y = 100,$$

$$\sum xy = 520, \sum x^2 = 650, \sum y^2 = 436.$$

Find the two regression coefficients.

(ix) Three urns contain 6 red, 4 black ; 3 red, 7 black and 5 red, 5 black balls respectively. One of the urns is selected at random and a ball is drawn from it. If the ball drawn is black, find the probability that it is drawn from the 2nd urn.

(x) Represent the following distribution by frequency polygon and histogram :

Class interval	10-20	20-30	30-40	40-50	50-60
Frequency	3	18	27	15	12