930

B. Pharmacy 2nd Semester Examination

Mathematics-II (O.S.)

HBP-104

Time : 3 Hours   **Max. Marks : 80**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/ continuation sheet will be issued.

Candidates are required to attempt five questions in all selecting one question from each section A, B, C, D of the question paper and all the subparts of the questions in section E. Use of non-programmable calculators is allowed.

SECTION - A

1.   (i) Evaluate $\int \tan^{-1}(\sec x + \tan x)dx$

      Solve the following differential equations:

  (ii) (3y–7x+7)dx +(7y–3x+3)dy=0.

  (iii) $\dfrac{dy}{dx} + x\sin 2y = x^3 \cos^2 y$

  (iv) A drug with k=0.01 is administered every 12 hours in doses of 4 mg. Calculate the amount of the drug in the patient's body after the 4th dose is taken.   **(4×4=16)**

2.   (i) Evaluate $\int e^x \left(\dfrac{1}{x} - \dfrac{1}{x^2} \right)dx$

      Solve the following differential equations:

  (ii) $\dfrac{dy}{dx} = \dfrac{4x + 2y - 1}{2x + y + 1}$

  (iii) $\left(x + 2y^2 \right)\dfrac{dy}{dx} = y.$

(iv) A representative of a pharmaceutical company recommends that a new drug of his Company is given every T hours in doses of quantity y_0, for an extended period of time. Find the steady state drug in the patient's body. **(4×4=16)**

SECTION - B

3. Find the Laplace transform of

(i) $te^{-4t} \sin 3t$　　　　(ii) $e^{-1}\dfrac{\sin 2t}{t}$

Find the inverse Laplace transform of

(iii) $\dfrac{s^2 + s + 4}{s^3 + 9s}$　　　(iv) $\dfrac{s+4}{s(s-1)(s^2+4)}$　　**(4×4=16)**

4. (i) State and prove the first shifting theorem of Laplace transform and hence or otherwise find L[f(t)], where

$$f(t) = \begin{cases} t^2 \text{ for } 0 < t < 1 \\ 4t \text{ for } 1 > 1 \end{cases}$$

(ii) Use Laplace-transformation to solve the following differential equation

$$\dfrac{d^2y}{dx^2} + 2\dfrac{dy}{dx} + 5y = e^{-x}\sin x, \text{ where y(0)=0,}$$

y(0)=1　　　　　　　　　　　　　　**(8×2=16)**

SECTION - C

5 (i) The following numbers give the weights of 55 students of a class. Prepare a suitable frequency table:

42, 74, 40, 60, 82, 115, 41, 61, 75, 83, 63, 53, 110, 76, 84, 50, 67, 65, 78, 77, 56, 95, 68, 69, 104, 80, 79, 79, 54, 73, 59, 81, 100, 66, 49, 77, 90, 84, 76, 42, 64, 69, 70, 80, 72, 50, 79, 52, 103, 96, 51, 86, 78, 94, 71. Draw the histogram and frequency polygon of the above data.

(ii) Calculate the mean and standard deviation for the following table giving the age distribution of 542 members: **(8×2=16)**

Ages in years	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of members	3	61	132	153	140	51	2

6. (i) An incomplete frequency distribution is given as follows:

Variable	10-20	20-30	30-40	40-50	50-60	60-70	70-80	Total
Frequency	12	30	?	65	?	25	18	229

Given that median value is 46, determine the missing frequencies using the median formula.

(ii) Write short notes on:

   (i) Data collection and data organization

   (ii) Frequency polygon and frequency curve

   (iii) 2-D and 3-D diagram

   (iv) Coefficient of variation. **(8×2=16)**

SECTION - D

7. (i) If two dice are thrown, what is the probability that the sum is

   (i) greater than 8 (ii) neither 7 nor 11.

   (ii) In a bolt factory machines A, B and C manufacture respectively 35%, 45% and 20% of the total. Of their output 6, 3 and 5 percent are defective bolts. One bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A, B and C? **(8×2=16)**

8. (i) Memory capacity of a student was tested before and after training. State at 5% level of significance whether the training was effective from the following score:

Students	1	2	3	4	5	6	7	8	9
Before	10	15	9	3	7	12	16	17	4
After	12	17	8	5	6	11	18	20	3

(ii)   Set up a two-way ANOVA table for the data given below:

Pieces of field	Treatment			
	A	B	C	D
P	45	40	38	37
Q	43	41	45	38
R	39	39	41	41

(8×2=16)

SECTION - E

9.   (i)   Write the order and degree of the differential equation

$$\frac{d^2y}{dx^2} = \left\{ y + \left(\frac{dy}{dx}\right)^2 \right\}^{1/3}$$

(ii)   Solution of the linear differential equation $\frac{dy}{dx} + Py = Q$, where P and Q are functions of x.

(iii)   Find the Laplace transformation of f(t) = t cos(at)

(iv)   Find the inverse Laplace transformation of

$$f(t) = \frac{5}{s+3} + \frac{2s}{s^2+25} + \frac{3}{s^2+16}$$

(v)   The mean mark of 100 students was given to be 40. It was found later that a mark 53 was read as 83. What is the corrected mean mark?

(vi)   Find out the missing figure: Median= Mean + ? (Mean-Mode)

(vii)   What is the probability of drawing a face card in a single random draw from a well shuffled pack of 52 cards?

(vii)   Find the mean and standard deviation of the number of heads in 100 tosses of a fair coin.   **(2×8=16)**