Total No. Printed Pages: 04

KAS-302

(Roll No. to be filled by candidate)

2	1	0	0	4	3	0	31	0	0	0	7

B. TECH.
THIRD SEMESTER THEORY EXAMINATION, 2022-23
KAS-302
MATHEMATICS-IV

Time: 03 Hours **Max. Marks: 100**

Note: Attempt all questions. All questions carry equal marks.

1. Attempt any ***FOUR*** parts of the following: 4×5

a. Solve the following differential equation CO1

$$y^2p - xyq = x(z - 2y)$$

b. Solve the differential equation CO1

$$x^2\frac{\partial z}{\partial x} + y^2\frac{\partial z}{\partial y} = (x + y)z$$

c. Solve the differential equation CO1

$$(p^2 + q^2)y = qz$$

d. Solve the differential equation CO1

$$\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial y^3} = e^{x+2y}$$

e. Find the differential equation of all spheres of fixed radius having their centres in xy-plane. CO1

2. Attempt any ***TWO*** parts of the following: 2×10

a. Using the method of separation of variables, solve CO2

$$\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$$

where $(x, 0) = 6e^{-3x}$.

b. Find the solution of wave equation CO2

$$\frac{\partial^2 y}{\partial t^2} = c^2\frac{\partial^2 y}{\partial x^2}$$

such that $y = p_0 \cos pt$, (p_0 is a constant) when

$x = l$ and $y = 0$ when $x = 0$

c The ends A and B of a rod 20cm long have the temperatures at 30^0 C and 80^0 C until steady state prevails. The temperatures of the ends are changed to 40^0 C and 60^0 C respectively. Find the temperature distribution in the rod at any point x and at time t. CO2

3. Attempt any ***FOUR*** parts of the following: 4×5

a. Find the relation between μ_r & μ_r' CO3

b. Find the movement generating function of the discrete Poisson distribution given by CO3

$$f(x) = \frac{e^{-m}m^x}{x!}$$

c. Find Karl Pearson's coefficient of skewness for the following data: CO3

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. Of students	08	12	20	30	15	10	5

d. Fit a straight line to the following data by least square method CO3

x	0	1	2	3	4
y	1.00	1.80	3.30	4.50	6.30

e. In a partially destroyed laboratory record of an analysis of a correlation data, the following results only are legible: CO3

Variance of x=9

Regression equations: $8x - 10y + 66 = 0$

and $40x - 18y = 214$

Calculate $\bar{x}$ and $\bar{y}$ and r.

4. Attempt any ***TWO*** parts of the following: 2×10

a. An urn contains 10 white and 3 black balls, while another urn contains 3 white and 5 black balls. Two balls are drawn from the first urn and put into the CO4

second urn and then a ball is drawn from the later. What is the probability that it is a white ball?

b. (i) During war, 1 ship out of 9 was sunk on an average in making a certain voyage. What was the probability that exactly 3 out of a convoy of 6 ships would arrive safely? CO4

(ii) If on an average one ship in every ten is wrecked, find the probability that out of 5 ships expected to arrive, 4 at least will arrive safely?

c. Data was collected over a period of 10 years, showing number of deaths from horse kicks in each of the 200 army corps. The distribution of deaths was as follows: CO4

No. of deaths:	0	1	2	3	4	total
Frequency:	109	65	22	3	1	200

Fit a Poisson distribution to the above data.

5. Attempt any ***TWO*** parts of the following: 2×10

a. A random sample of size 16 has 53 as mean. The sum of squares of the deviation from mean is 135. Can this sample be regarded as taken from the population having 56 as mean? Obtain 95% and 99%confidence limits of the mean of the population. CO5

b. The following table gives the number of aircraft accidents that's occurs during various day of week. Find whether the accidents are uniformly distributed over the week CO5

Days	Sun	Mon	Tues	Wed	Thurs	Fri.	Sat.
No.of accidents	14	16	8	12	11	9	14

Given: the value of Chi square significant at 5, 6, 7, d.f. are respectively 11.07, 12.59, 14.07 at the 5% level of significance

c. In a blade manufacturing factory, 1000 blades are examined daily. Draw the *np*- chart for the following table and examine whether the process is under control? CO5

Total No. Printed Pages: 04

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. of defective blade	9	10	12	8	7	15	10	12	10	8	7	13	14	15	16