Sub Code:KAS302

Paper Id: 1993 Roll No:

B. TECH
(SEM-III) THEORY EXAMINATION 2019-20
MATHEMATICS-IV

Time: 3 Hours *Total Marks: 100*

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

Q no.	Question	Marks	CO
a.	Solve the following partial differential equation $yq - xp = z$.	2	1
b.	Solve the Cauchy's problem $u_x - u_y = 0$. $u(x,0) = x$	2	1
c.	Classify the following equation. $x^2\frac{\partial^2 u}{\partial t^2} - \frac{\partial^2 u}{\partial t^2} = u$	2	2
d.	Solve the partial differential equation $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x\,\partial y} = 0$.	2	2
e.	Find the median of 6,8,9,10,11,12.13.	2	3
f.	The first three central moments of a distribution are 0,15,-31. Find the moment of coefficient of skewness.	2	3
g.	If the p.m.f of a discrete random variable X is X: 1, 2, 3 f(x): $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{6}$ Determine E(X) and V(X).	2	4
h.	The probability density function f(x) of a continuous random variable X is defined by $f(x) = \begin{cases} \frac{A}{x^2}, & 5 \le x \le 10 \\ 0, & \text{otherwise} \end{cases}$ Find the value of A.	2	4
i.	Find the mean of the Binomial Distribution $B\left(4, \frac{1}{3}\right)$.	2	4
j.	A machine which produces mica insulating washers for use in electric device to turn out washers having a thickness of 10 mm. A sample of 10 washers hasan average thickness 9.52 mm with a standard deviation of 0.6 mm. Find out t.	2	5

SECTION B

2. Attempt any *three* of the following: **3 x 10 = 30**

Q no.	Question	Marks	CO
a.	Solve $(D^2 - DD' - 2D'^2)z = (y-1)e^x$	10	1
b.	A rectangular plate with insulated surface is 10 cm wide and so long compared to its width that it may be considered infinite in length without introducing an appreciable error. If the temperature along the short edge y=0 is given by: $u(x,0) = \begin{cases} 20x & 0 \le x \le 5 \\ 20\,(10-x) & 5 < x < 10 \end{cases}$ While the two edges x=0 and x=10 as well as the other short edge are kept at 0°C. Find the steady state temperature at any point (x,y) of the plate.	10	2

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c.	Find an exponential curve $PV^{\gamma} = k$ for the data: V: 50, 100, 150, 200 P: 135, 48, 26, 17	10	3
d.	Fit a Poisson distribution to the following data which give the number of yeast cells per square for 400 squares X: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 F: 103, 143, 98, 42, 8, 4, 2, 0, 0, 0, 0 It is given that $e^{-1.52}=0.2674$.	10	4
e.	To test the effectiveness of inoculation against cholera , the following table was obtained (see table below) (The figure represents the number of persons) Use Chi square test to defend or refute the statement. The inoculation prevents attack from cholera. The value of χ^2 for 1 degree of freedom at 5% level is 3.841.	10	5

Table for c.:

V	50	100	150	200
P	135	48	26	17

Table for d.:

X	0	1	2	3	4	5	6	7	8	9	10
F	103	143	98	42	8	4	2	0	0	0	0

Table for e.:

	Attached	Not attached	Total
Inoculated	30	160	190
Not inoculated	140	460	600
Total	170	620	790

3. Attempt any *one* part of the following: 1 x 10 = 10

Q no.	Question	Marks	CO
a.	Solve $(D+1)(D+D'-1)z = \sin(2x+3y)$	10	1
b.	In a partial destroyed laboratory record of an analysis of correlation data, the following result only are legible : Variance of x = 9 Regression equation: 8x-10y + 66 = 0, 40x -18y = 214. What were (a) the mean value of x and y (b) the standard deviation of y and the co-efficient of correlation between x and y?	10	3

4. Attempt any *one* part of the following: 1 x 10 = 10

Q no.	Question	Marks	CO
a.	Solve $x^2\frac{\partial^2 z}{\partial x^2} - 4y^2\frac{\partial^2 z}{\partial y^2} - 4y\frac{\partial z}{\partial y} - z = x^2y^2\log y$	10	1
b.	A tightly stretched string with fixed end points x=0 and $x = l$ is initially in a position given by $y = y_0 \sin^3\frac{\pi x}{l}$. If it is released from rest from this position, find the displacement y(x,t).	10	2

5. Attempt any *one* part of the following: 1 x 10 = 10

Q no.	Question	Marks	CO
a.	An insulated rod of length l itsends A and B maintained at 0°C and 100° C respectively until the steady state condition prevails. If B is suddenly reduced to 0°C and maintained at 0°C , Find the temperature at a distance x from A at time t.	10	2

b.	Find the multiple regression equation of X_1 on X_2 and X_3 from the data Given below:	10	3

X_1	3	5	6	8	12	10
X_2	10	10	5	7	5	2
X_3	20	25	15	16	15	2

6. Attempt any *one* part of the following: 1 x 10 = 10

Q no.	Question	Marks	CO
a.	State the Bayes' theorem. The probability that a civilian can hit a target is $\frac{2}{5}$ and the probability that an army officer can hit the same target is $\frac{3}{5}$While the civilian canfire 8 shots in the time, the army officer fires 10 shots. If they fire together, then what is the probability that army officer shoots the target?	10	4
b.	Define the Normal distribution. The daily wages of 1000 workers are distributed around a mean of Rs. 140 and with a standard deviation of Rs. 10. Estimate the number of workers whose daily waged will be (i) between Rs. 140 and Rs. 144, (ii) less than Rs. 126 (iii) more than Rs. 160.	10	4

7. Attempt any *one* part of the following: 1 x 10 = 10

Q no.	Question	Marks	CO
a.	An IT company wants to appoint an effective trainer to improve the performance of their engineers. Four group of 7,8,10 and 11 engineers from total 36 engineers were given 5 days training by the 4 trainers. Scores were awarded to the engineers at the end of the training on their Skills. Let us examine the preference of one engineer of one trainer over other three trainers. Given that α=0.05 i.e at 5%level of significance the value of F (3,32)=3.29.	10	5
b.	Distinguish between p chart and C chart. The number of defectives in 17 samples of size 500 each from 17 lots is shown below:	10	5

Samples	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
No.of defectives	20	25	35	45	15	65	15	20	35	23	12	9	21	22	32	35	38

Find out the control limits for the number of defective units and also check whether the process is under control or not.

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Paper Id: 233295 **Roll No.** | | | | | | | | | | |

BTECH
(SEM III) THEORY EXAMINATION 2022-23
MATHEMATICS IV

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

(a) Find partial differential equation (PDE) by eliminating a and b from $z = ax + by + a^2 + b^2$.

(b) Solve the PDE, $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial y^2} = 0$.

(c) Classify the PDE, $u_{xx} + u_{yy} - u_{xy} = 0$.

(d) Write the wave equation in two dimensions.

(e) Find the arithmetic mean of the following frequency distribution:

x	1	2	3	4	5	5	7
f	5	9	12	17	14	10	6

(f) Write the formula of Karl Pearson correlation coefficient and write the range of correlation coefficient.

(g) If $P(A) = \frac{1}{4}, P(B) = \frac{1}{2}, P(A \cup B) = \frac{5}{8}$, then find the value of $P(A \cap B)$.

(h) Write probability mass function of binomial distribution with mean and variance of the distribution.

(i) Define "Null Hypothesis".

(j) Discuss (in brief) "Control Charts".

SECTION B

2. Attempt any *three* of the following: **10x3=30**

(a) Solve $\left(x^2D^2 - y^2D'^2\right) = xy$, where $D^2 = \frac{\partial^2}{\partial x^2}, D'^2 = \frac{\partial^2}{\partial y^2}$.

(b) A string is stretched and fastened to two points l meter apart. Motion is started by displacing the string in the form $u(x, 0) = A \sin\frac{\pi x}{l}$ from which it is released at time $t = 0$. Show that the displacement of any point at a distance x from one end at time t is given by $u(x, t) = A \sin\frac{\pi x}{l} \cos\frac{\pi ct}{l}$.

(c) Fit a parabolic curve of second degree to the following data:

X:	0	1	2	3	4
Y:	1	1.8	1.3	2.5	6.3

(d) A bag contains 10 white and 15 black balls. If two balls are drawn in succession without replacement, then find the probability that the first ball is white and the second ball is black.

(e) The score of 10 candidates obtained in tests before and after attending some coaching classes are given below:

Before:	54	76	92	65	75	78	66	82	80	78
After:	60	80	86	72	80	72	66	88	82	73

Is the coaching for the test effective? Test at 5% level of significance.

SECTION C

3. Attempt any *one* part of the following: 10x1=10

(a) Solve, $(mz - ny)p + (nx - lz)q = ly - mx$, where $p = \frac{\partial z}{\partial x}$ & $q = \frac{\partial z}{\partial y}$.

(b) By Charpit's method, find the complete solution of PDE:

$$px + qy - pq = 0.$$

4. Attempt any *one* part of the following: 10x1=10

(a) Solve by the method of separation of variables, the heat equation $u_t = u_{xx}, 0 < x < 1, t > 0$subject to the initial and boundary conditions $u(x,0) = x - x^2, u(0,t) = u(1,t) = 0$.

(b) Solve the Laplace equation $u_{xx} + u_{yy} = 0 x \in (0,1), y \in (0,1)$ with the conditions $u(x,0) = u(x,1) = 0$ and $u(0,y) = 0, u(1,y) = f(y)$ by using the method of separation of variables.

5. Attempt any *one* part of the following: 10x1=10

(a) Calculate the correlation coefficient for the following heights (in inches) of fathers(X) and their sons (Y):

X:	65	66	67	67	68	69	70	72
Y:	67	68	65	68	72	72	69	71

(b) The first four moments of a distribution about the value 4 of the variables are $-1.5, 17, -30$ and 80. Find moments $\mu_1, \mu_2, \mu_3, \mu_4$ about mean. Also find β_1 and β_2.

6. Attempt any *one* part of the following: 10x1=10

(a) A random variable X has the following probability distribution values of X:

X:	0	1	2	3	4	5	6	7
$P(X)$:	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

Then, evaluate $P(X \geq 6)$.

(b) For continuous random variable Xif

$$f(x) = \frac{3}{4}(x^2 + 1), 0 \leq x \leq 1.$$

then,

(i) Verify that $f(x)$ is a probability distribution function.

(ii) Find λ such that $P(X \leq \lambda) = P(X > \lambda)$.

7. Attempt any *one* part of the following: 10x1=10

(a) The values in two random samples are given below:

Sample1:	15	25	16	20	22	24	21	17	19	23		
Sample2:	35	31	25	38	26	29	32	34	33	27	29	31

Can we conclude that the two samples are drawn from the same population? Test at 5% level of significance.

(b) Discuss one way analysis of variance (ANOVA) with mathematical model and assumptions in the model.

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B TECH
(SEM-III) THEORY EXAMINATION 2020-21
MATHEMATICS-IV

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

Q no.	Question	Marks	CO
a.	What is the auxiliary equation of Charpit Method?	2	1
b.	Solve $z = px + qy + \sqrt{1 + p^2 + q^2}$	2	1
c.	Classify the following Partial Differential Equation $4\frac{\partial^2 u}{\partial x^2} + 4\frac{\partial^2 u}{\partial x \partial t} + \frac{\partial^2 u}{\partial t^2} = 0$	2	2
d.	Explain the Radio Equations.	2	2
e.	The first two moments of a distribution about the value '2' of the variable are 1,16. Show that mean is 3, variance is 15.	2	3
f.	If the regression coefficient is 0.8 and 0.2, What will be the value of coefficient of Correlation.	2	3
g.	If the function f(x) is defined by $f(x) = ce^{-x}, 0 < x < \infty$ calculate the value of c which changes f(x) to a probability density function.	2	4
h.	Identify the following statement is true or false "For a Binomial Distribution, mean is 6 and variance is 9.	2	4
i.	When is the test statistic $F = \frac{S_1^2}{S_2^2}$ is used?	2	5
j.	Explain the t-test for small samples.	2	5

SECTION B

2. Attempt any *three* of the following: **3 x 10 = 30**

a.	Solve $x^2\frac{\partial^2 z}{\partial x^2} + 2xy\frac{\partial^2 z}{\partial x \partial y} + y^2\frac{\partial^2 z}{\partial y^2} = x^m y^n$.	10	1
b.	Calculate the deflection u(x,t) of a tightly stretched vibrating string of unit length that is initially at rest and whose initial position is given by $sin\pi x + \frac{1}{3}sin3\pi x + \frac{1}{5}sin5\pi x, \quad 0 \le x \le 1$	10	2
c.	Use the Method of Least Squares, find the curve $y = ab^x$ that best fits the following data:	10	3
d.	State Baye's Theorem. The contents of urns I, II and III are as follows:1 white,2 black and 3 red balls; 2 white, 1 black and 1 red balls; 4 white, 5 black and 3 red balls. One urn is chosen at random and two balls drawn. They happen to be white and red. What is the probability that they come from urn I?	10	4
e.	From the following table regarding the color of eyes of father and son, test if the color of son's eye is associated with that of father. Given $\chi^2_{0.05}(1)=3.841$	10	5

x	2	3	4	5	6
y	8.3	15.4	33.1	65.2	127.4

Eye color of father	Eye color of son	
	Light	Not Light
Light	471	51
Not Light	148	230

SECTION C

3. Attempt any *one* part of the following:

Q no.	Question	Marks	CO
a.	Solve the Partial Differential Equation: $D(D + D' - 1)(D + 3D' - 2)z = x^2 - 4xy + 2y^2$.	10	1
b.	Solve : $(x^2 - y^2 - yz)p + (x^2 - y^2 - zx)q = z(x - y)$.	10	1

4. Attempt any *one* part of the following:

Q no.	Question	Marks	CO
a.	A rod of length $l$with insulated sides is initially at a uniform temperature u_0. Its ends are suddenly cooled to 0^0C and are kept at that temperature. Calculate the temperature function $u(x,t)$.	10	2
b.	Solve the equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ subject to the boundary conditions, $u(0,y)=u(l,y)=u(x,0)=0$ and $u(x,a)=sin\frac{n\pi x}{l}$	10	2

5. Attempt any *one* part of the following:

Q no.	Question	Marks	CO
a.	Calculate the moment generating function of the discrete Binomial Distribution given by P(x)= ${}^nC_x p^x q^{n-x}$ where (q=1-p).Also find the first and second moments about the mean.	10	3
b.	The following table gives age (x) in years of cars and annual maintenance cost (y) in hundred rupees. x: 1, 3, 5, 7, 9 y: 15, 18, 21, 23, 22 Calculate the maintenance cost for a 4-year-old car after finding the regression equation.	10	3

6. Attempt any *one* part of the following:

Q no.	Question	Marks	CO
a.	Show that Poisson Distribution is a particular limiting form of the Binomial Distribution when p or q is very small, and n is large enough.	10	4
b.	A sample of 100 dry battery cells tested to find the length of life produced the following results:$\bar{x}$=12 hours, σ=3 hours. Assuming the data to be normally distributed, what percentage of battery cells are expected to have life (i) more than 15 hours (ii) less than 6 hours (iii) between 10 and 14 hours.	10	4

7. Attempt any *one* part of the following:

Q no.	Question	Marks	CO
a.	It is desired to compare three hospitals with regards to the number of deaths per month. A sample of death records were selected from the records of each hospitals and number of deaths was as given below. From mentioned data, determine the difference in the number of deaths per months among three hospitals: Hospitals A: 3, 4, 3, 5, 0 B: 6, 3, 3, 4, 4 C: 7, 3, 4, 6, 5 (Given: at 5% level of significance, $F_{2,12}$=3.89)	10	5
b.	Distinguish between the np-chart and p-chart. Following is the data of defective of 10 samples of size 100 each. Construct np chart and examine whether the process is in statistical control? Sample no.: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 No. of defectives: 6, 9, 12, 5, 12, 8, 8, 16, 13, 7	10	5

PAPER ID-411526

Subject Code: KAS302

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM III) THEORY EXAMINATION 2021-22
MATHEMATIVS-IV

***Time*: 3 Hours** ***Total Marks*: 100**

Instructions: Attempt the questions as per the given instructions. Assume missing data suitably.

Section – A

Attempt **all**parts in brief. **2 x 10=20**

Q.1.	Question	Marks	CO.
(a).	Solve the following partial differential equation $(D^2 + DD')z = 0$.	2	1
(b).	Derive a partial differential equation by eliminating the constants a and b from $z = ax + a^2y^2 + b$.	2	1
(c).	Write radio wave equations.	2	2
(d).	Classify the partial differential equation $u_{xx} + 3u_{xy} + u_{yy} = 0$	2	2
(e).	In an asymmetrical distribution mean is 16 and median is 20.Calculate the mode of the distribution.	2	3
(f).	The lines of regression of y on x and x on y are respectively $y = x + 5$ and $16x - 9y = 94$, Find the correlation coefficient.	2	3
(g).	Four persons are chosen at random from a group containing 3 men, 2 women and 4 children. Provethatthe chance that exactly two of them will be children is 10/21.	2	4
(h).	If the probability density functions $f(x) = \begin{cases} kx^3, & if\ 0 \le x \le 3 \\ 0, & elsewhere \end{cases}$, find the value of 'k'.Also, find the probability between $x = \frac{1}{2}$ *and* $x = \frac{3}{2}$.	2	4
(i).	Explain t-test for "small samples".	2	5
(j)	What do you mean by statistical quality control (SQC)?	2	5

Section – B

Attempt **any three** parts ofthefollowing **10 x 3 =30**

Q2.	Question	Marks	CO
(a).	Solve the partial differential equation$(D - D' - 1)(D - D' - 2) = \sin(2x + 3y)$	10	1
(b).	A laterally insulated bar of length has its ends A and B maintained at 0^0C and 100^0C respectivel until steady state conditions prevail. If the temperature at B is suddenly reduced to 0^0C and kept s while that of A is maintained at 0^0C. Find the temperature at a distance x from A at any time t.	10	2
(c).	Calculate the first four central moments about the mean of the following data:	10	3
(d).	In a sample of 1000 cases, the mean of a certain test is 14 and S.D is 2.5. Assuming the distribution to be normal, find **(i)** How many students score between 12 and 15? **(ii)** How many score above 18? **(iii)** How many score below 8? *Given* $f(0.8) = 0.2881,\ f(0.4) = 0.1554,\ f(1.6) = 0.4452,\ f(2.4) = 0.4918.$	10	4
(e).	In an experiment on immunization of cattle from tuberculosis the following results were obtained:	10	5

x	0	1	2	3	4	5	6	7	8
f	1	8	28	56	70	56	28	8	1

	Affected	Unaffected
Inoculated	12	28
Not Inoculated	13	7

Examine the effect of vaccine in controlling the incidence of the disease.

[*Given* $\chi^2_{0.05,1} = 3.84$]

Subject Code: KAS302

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BTECH
(SEM III) THEORY EXAMINATION 2021-22
MATHEMATIVS-IV

Section – C

Attempt **any one** part ofthefollowing **10x 1 = 10**

Q3.	Question	Marks	CO
(a).	Solve $(y+zx)p-(x+yz)q=x^2-y^2$	10	1
(b).	Solve $(x^2D^2-4xyDD'+4D'^2+6D')z=x^3y^4.$	10	1

Attempt **any one** part ofthefollowing **10x 1 = 10**

Q4.	Question	Marks	CO
(a).	Solve the following partial differential equation by using method of separation of variables: $\frac{\partial z}{\partial x}+\frac{\partial^2 z}{\partial y^2}=0;\ z(x,0)=0,\ z(x,\pi)=0, z(0,y)=4\sin 3y.$	10	2
(b).	A string is stretched and fastened to two points*l*m apart. Motion is started by displacing the string in the form $u(x,0)=A\sin\frac{\pi x}{l}$ from which it is released at time t=0. Show that the displacement of any point at a distance x from one end at time t is given by $u(x,t)=A\sin\frac{\pi x}{l}\cos\frac{\pi ct}{l}$.	10	2

Attempt **any one** part ofthefollowing **10x 1 = 10**

Q5.	Question	Marks	CO
(a).	Fit a parabolic curve of regression of y on x to the following data: x: 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0 y: 1.1, 1.3, 1.6, 2.0, 2.7, 3.4, 4.1	10	3
(b).	Let the random variable X assume the value $'r'$ with the probability law $p(X=r)=q^{r-1}p;\ r=1,2,3.....$ Find the m.g.f of X and hence it's mean and variance.	10	3

Attempt **any one** part ofthefollowing **10x 1 = 10**

Q6.	Question	Marks	CO
(a).	Fit a binomial distribution for the following data and compare the theoretical frequencies with the actual ones x: 0, 1, 2, 3, 4, 5 f: 2, 14, 20, 34, 22, 8	10	4
(b).	The number of accidents in a year involving taxi drivers in a city follows a Poisson distribution with mean equal to 3. Out of 1000 taxi drivers, find approximately the number of drivers such that i. No accident in a year ii. More than three accidents in a year. $(given, e^{-3}=0.04979).$	10	4

Attempt **any one** part ofthefollowing **10x 1 = 10**

Q7.	Question	Marks	CO
(a).	In two independent sample of size 8 and 10, the sum of square of deviations of the sample values from the respective means were 84.4 and 102.6. Test whether the difference of variances of populations is segment or not. Use a 5% level of significance. $[F_{0.05,(7,9)}=3.29]$	10	5
(b).	An inspection of 10 samples of size 400 each from 10 lots revealed the following number of defective units: 17, 15, 14, 26, 9, 4, 19, 12, 9, 15.Draw the np-charts and state whether the proces is under control or not.	10	5