Registration No: | | | | | | | | | | |

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B.ARCH
15AH113

1^{st} Semester Regular / Back Examination 2017-18
APPLIED MATHEMATICS
BRANCH: B.ARCH
Time: 3 Hours
Max Marks: 100
Q.CODE: B732
Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.

Part – A (Answer all the questions)

Q1 **Answer the following questions:** ***multiple type or dash fill up type*** **(2 x 10)**

a) If the feasible region of a given LPP is bounded then the optimal solution of that LPP has
(a)no solution(b)unique solution(c)infinite solution(d)none ?

b) The equation $\sqrt{fx} + \sqrt{gy} + \sqrt{hz} = 0$ represents
(a) Sphere (b) cylinder (c) cone (d) none

c) The system of equations x + y + z = 0 , 2x + 2y + 2z =1 ,
4x + 4y + 4z= 0 possesses
(a)no solution(b)unique solution(c)infinite solution(d)none

d) Let A = $[a_{IJ}]$ be a 3× 3 matrix such that a_{ij} = 1 for all I and j, then the rank of A is __________

e) The area bounded by the parabola $y^2 = 4ax$ and its latus rectum is ___

f) The mean and median of 100 items are 50 and 52 respectivily.the value of largest item is 100 but it was later found that it is actually 110,then value of true median is____________

g) The optimal solution of the LPP ,Max z=6x – 2y s.t 2x – y≤ 2 and $x \le 4$;x,y≥ 0 $posseses$?
(a)no solution(b)unique solution(c)infinite solution(d)none

h) The arc length of the curve y=f(x) lying between two points for which x=a and x=b (b>a) is ______________

i) Volume of the sphere $x^2 + y^2 + z^2 + 2x - 4y + 8z - 2$ is ________

j) The area of the first quadrant bounded by y –axis and the curve y=sin x , $y = \cos x$ is ___________

Q2 Answer the following questions: ***Short answer type*** **(2 x 10)**

a) Let 10 is the mean of 7 observations and 5 is the mean of a set of 3 0bservation, and then what is the mean of the combined set of observations.

b) Find the rank of A = $\begin{bmatrix} 2 & 0 & 1 \\ 1 & 2 & 2 \\ 1 & 1 & 6 \end{bmatrix}$

c) Write the condition, when a single variable function possesses maximum and minimum value.

d) Let A = $[a_{IJ}]$ be a n× n matrix such that rank of A = n -1, what is the rank of Adjoint of A.

e) Calculate the standard deviation for the following age distribution of 542 members

Age :	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No.of member:	3	61	132	153	140	51	2

f) Find the mode for the following distributions

Class interval :	0-10	10-20	20-30	30-40	40-50	50-60
frequency:	5	8	7	12	28	20

g) Write down two demerits of Mode ?

h) Write the condition when lines of Regression become perpendicular and parallel to each other?

i) What is Golden ratio?

j) Define standard deviation and root mean square deviation?

<u>Part – B (Answer any four questions)</u>

Q3 a) Let (X, Y) have the joint Probability Density Function given by $f(x,y) = \begin{cases} 1, & |y| < x,\ 0 < x < 1 \\ 0, & otherwise \end{cases}$. Show that Regression of Y on X is linear but regression of X on Y is not linear ? **(10)**

b) Prove that for any discrete distribution standard deviation is not less than mean deviation from mean. **(5)**

Q4 a) Calculate the correlation coefficient for the following height(in inches) of Father(X) and their son (Y) **(10)**

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

b) Find the maximum value of the f(x) = $8x^5 - 15x^4 + 10x^2$ **(5)**

Q5 a) Using Simplex method solve Max Z = $4x_1 + 10x_2$ **(10)**

s.t $2x_1 + x_2 \leq 50$

$2x_1 + 5x_2 \leq 100$

$2x_1 + 3x_2 \leq 90$

b) Solve the system of linear equations 10x- y + 2z = 4 , x+10y – z = 3 , 2x + 3y + 20z = 7 by Gauss elimination method. **(5)**

Q6 a) State Lagrange mean value theorem and using Lagrange mean value theorem $\frac{x}{1+x} < \log(1+x) < x, x > 0$ **(10)**

b) Show that the maximum value of $f(x) = (\frac{1}{x})^x$ is $(e)^{\frac{1}{e}}$ **(5)**

Q7 a) Find equation of the sphere intersecting the sphere $x^2 + y^2 + z^2 + x - 3z - 2 = 0, x^2 + y^2 + z^2 + \frac{1}{2}x + \frac{3}{2}y = 0$ orthogonally and passing through the points (0,3,0) , (-2,-1,-4) **(10)**

b) Find the equation of right circular cylinder of radius 2 and whose axis passes through the point (1, 2, 3) and has direction cosines proportional to (2, -3, 6)? **(5)**

Q8 **a)** Define regression coefficients and also Find the Regression lines from the following data **(10)**

Age X :	27	25	22	20	18	17	16
Height Y:	70	69	68	62	56	54	50

b) Write down the property of regression line and regression coefficient. **(5)**

Q9 **a)** Find the length of the arc of the following curve **(10)**

(a) y = $\frac{1}{6}x^3 + \frac{1}{2}x^{-1}$ between the ordinates x = 1 and x = 2

(b) x(t) = t - sin t , y(t) = 1 - cos t for $0 \leq t \leq \frac{\pi}{4}$

b) State Rolle's theorem and verify it for the function f(x) = $\frac{\sin x}{e^x}$, $x \in (0, \pi)$ **(5)**