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Reg. No. : ....

Name : ....

Fifth Semester B.Tech. Degree Examination, November 2014
(2008 Scheme)
08.501 : ENGINEERING MATHEMATICS – IV (CMPU)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **4** marks.

1. Find the value of K for which the following is a probability distribution function. Also find the mean.

x :	0	1	2	3
f(x) :	$K/2$	$K/3$	$K+1/3$	$2K-1/6$

2. A die is tossed thrice. A success is getting '1 or 6' on a toss. Find the mean and variance of the success.

3. If X is a Poisson variate such that P[X = 1] = P[X = 2]. Find P[X = 4].

4. For a normally distributed variate with mean 1 and standard deviation 3, find the probability that $3.43 \le X \le 6.19$.

5. Write the normal equations for fitting a curve of the form $y = ae^{bx}$.

6. Show that coefficient of correlation satisfies the relation $-1 \le r \le 1$.

7. Interpret the regression coefficients y on x and x on y.

8. Solve graphically

   Maximize $Z = 4x_1 + 10x_2$

   Subject to $5x_1 + 3x_2 \le 15$

   $2x_1 + 5x_2 \le 10,\ x_1,\ x_2 \ge 0.$

P.T.O.

9. Rewrite in standard form the following LPP.

Maximize, $Z = 2x_1 + x_2 + 4x_3$

Subject to $-2x_1 + 4x_2 \leq 4$

$x_1 + 2x_2 + x_3 \geq 5$

$2x_1 + 3x_3 \leq 2$

where $x_1, x_2 \geq 0$ and x_3 is unrestricted in sign.

10. Construct the dual of

Minimize $Z = 2x_1 + 3x_2 + 4x_3$

Subject to $2x_1 + 3x_2 + 5x_3 \geq 2$

$3x_1 + x_2 + 7x_3 = 3$

$x_1 + 4x_2 + 6x_3 \leq 0$

$x_1, x_2, x_3 \geq 0.$

PART – B

Answer **one** question from **each** Module. **Each** question carries **20** marks.

Module – I

11. a) Verify whether the function $f(x) = \frac{1}{18}(3 + 2x),\ 2 \leq x \leq 4$

$= 0$, otherwise

is a probability distribution function. If so find $P[3.43 \leq X \leq 6.19]$.

b) If the probability that an individual suffers a bad reaction from a certain injection is 0.002, determine the probability that out of 1000 individuals (i) exactly 3 (ii) more than 3 individuals will suffer the bad reaction.

c) In a normal destribution 5% of the items are below 60 and 40% are between 60 and 65. Find the mean and standard deviation of the distribution.

12. a) If X has a uniform distribution in $(-K, K)$, $K > 0$ find K such that $P[|X| < 1] = P[|X| > 1]$.

b) A machine manufacturing screws is known to produce 5% defectives. In a random sample of 15 screws what is the probability that there are

i) exactly 2 defectives

ii) not more than 3 defectives.

c) The time is hours required to repair a machine is exponentially distributed with parameter $\lambda = \frac{1}{20}$. What is the probability that the required time

i) exceeds 30 hrs

ii) is between 16 hrs and 24 hrs

iii) at most 10 hrs.

Module – II

13. a) From the following data, find the most likely value of y when x = 24

	y	x	
Mean	985.8	18.1	r = 0.58
Standard Deviation	36.4	2.0	

b) Fit a parabola of the form $y = a + bx^2$ to the following data :

x :	1	2	3	4	5
y :	0.43	0.83	1.4	2.33	3.42

c) The mean operating life for a random sample of 10 light bulbs is 4000 hrs with standard deviation 200 hrs. Estimate 95% confidence interval for the population mean.

14. a) Two lines of regression are x + 2y – 5 = 0 and 2x + 3y – 8 = 0 and variance x = 12. Find $\overline{x}, \overline{y}$ and r.

b) A stenographer claims that she can take dictation at the rate of 120 words per minute. Can we reject her claim on the basis of 100 trials in which she demonstrates a mean of 116 words with a standard deviation of 15 words. Use 5% level of significance.

c) A coin is tossed 10,000 times and 'Head' turns up 5195 times. Is the coin unbiased ?

Module – III

15. a) Ten grams of the alloy A contains 2 gm of copper, 1 gm of zinc and 1 gm of lead. Ten grams of alloy B contains 1 gm of copper, 1 gm of zinc and 3 gm of lead. It is required to produce a mixture of these alloy containing at least 10 gms of copper, 8 gms of zinc and 12 gms of lead. Alloy B costs 1.5 times as much per kg as alloy A. Find the amount of alloy A and alloy B which must be mixed in order to satisfy the restriction of the composition and at the same time keeping the cost a minimum. Formulate the problem as a linear programming problem.

b) Find the solution of the following problem by considering its dual

Minimize, $Z = 10x_1 + 2x_2 - 12x_3$

Subject to $x_1 - 2x_2 - 4x_3 \geq 3$

$-x_1 - 3x_2 + x_3 \leq 1,\ x_1, x_2, x_3 \geq 0.$

16. a) Solve graphically,

Minimize, $Z = 2x_1 + x_2$

Subject to $5x_1 + 10x_2 \leq 50$

$x_1 + x_2 \geq 1$

$x_2 \leq 4$

$4x_1 + 6x_2 \leq 48,\ x_1, x_2 \geq 0.$

b) Solve by Simplex method,

Maximize, $Z = 2x_1 + 2x_2 + 4x_3$

Subject to $2x_1 + 3x_2 + x_3 \leq 300$

$x_1 + x_2 + 3x_3 \leq 300$

$x_1 + 3x_2 + x_3 \leq 240,\ x_1, x_2, x_3 \geq 0.$