



Reg. No. :

Name :

**Fifth Semester B.Tech. Degree Examination, October 2016
(2013 Scheme)**

13.501 : ENGINEERING MATHEMATICS – IV (BCHMPSU)

Time : 3 Hours

Max. Marks : 100

PART – A

Answer **all** questions, **each** question carries 4 marks.

1. Derive the mean and variance of Poisson distribution.
2. Explain :
 - i) Type I and Type II errors
 - ii) Critical region
 - iii) Significance level
 - iv) Power of a test.

3. Find the rank correlation between the marks of economics and statistics

Marks of Statistics	:	65	60	68	75	66	74	77	63
Marks of Economics	:	49	70	75	40	43	60	55	61

4. Explain degeneracy in LPP
5. Find the dual of $\text{Max } Z = x_1 + 6x_2$
Subject to $x_1 + x_2 \leq 2$
 $x_1 + 3x_2 \leq 3$
 $x_1, x_2 \geq 0.$

PART – B

Answer **one full** question from **each** Module, **each** question carries 20 marks.

Module – 1

6. a) The probability that a pen manufactured by a company will be defective is $\frac{1}{10}$.
If 12 such pens are manufactured, find the probability that
 - i) Exactly 2 will be defective
 - ii) Atleast 2 will be defective
 - iii) None will be defective.



b) Given the pdf $f(x) = \begin{cases} 2x & 0 < x < 1 \\ 0 & \text{Elsewhere} \end{cases}$

i) Find the distribution function

ii) Find $P\left(X \leq \frac{1}{2}\right)$

iii) Find $P\left(\frac{1}{4} \leq X \leq \frac{1}{2}\right)$

7. a) Fit a Poisson distribution and hence find the theoretical frequencies

x :	0	1	2	3	4
f :	192	100	24	3	1

b) In an examination taken by 500 candidates, the average and the standard deviation of marks obtained (normally distributed) are 40% and 10%. Find approximately.

- How many will pass if 50% is fixed as a minimum ?
- What should be minimum if 350 candidates are to pass ?
- How many have scored marks above 60% ?

Module – 2

8. a) Calculate the coefficient of correlation between the level of investment and the rate of interest

Investment	:	1200	1100	900	1000	700	400
Rs. (in Crores)							
Rate of interest	:	6	7	10	9	11	12

b) The following data gives the age and the blood pressure of 10 persons

Age	:	65	42	36	47	49	62	60	72	63	55
Blood pressure	:	147	125	118	128	145	140	155	180	149	150

- Determine the regression equations.
 - Determine the blood pressure of a person whose age is 45.
 - Determine the age when blood pressure is 170.
9. a) For sample 1, $n_1 = 1000$, $\Sigma X = 49000$, $\Sigma (X - \bar{X})^2 = 784000$
 For sample 2, $n_2 = 1500$, $\Sigma X = 70500$, $\Sigma (X - \bar{X})^2 = 2400000$
 Discuss the significance of the difference of the sample means.



b) A machine is producing bolts of which a certain fraction is defective. A random sample of 400 is taken from a large batch and is found to contain 30 defective bolts. Does this indicate that the proportion of defectives is larger than that claimed by the manufacturer where the manufacturer claims that only 5% of his products are defective ? Find 95% confidence limits of the proportion of defective bolts in batch.

Module – 3

10. a) Solve the following LPP :

$$\text{Max } Z = 6x_1 + 4x_2$$

$$\text{Subject to } -2x_1 + x_2 \leq 2,$$

$$x_1 - x_2 \leq 2$$

$$3x_1 - 2x_2 \leq 9$$

$$x_1, x_2 \geq 0$$

b) Solve the LPP

$$\text{Min } Z = 3x_1 + 8x_2$$

$$\text{Subject to } x_1 + x_2 = 200,$$

$$x_1 \leq 80$$

$$x_2 \geq 60$$

$$x_1, x_2 \geq 0.$$

11. a) Solve the following LPP

$$\text{Max } Z = 3x_1 + 5x_2 + 4x_3$$

$$\text{Subject to } 2x_1 + 3x_2 \leq 8,$$

$$2x_2 + 5x_3 \leq 10,$$

$$3x_1 + 2x_2 + 4x_3 \leq 15$$

$$x_1, x_2, x_3 \geq 0.$$

b) A chemical company produces two compounds A and B. The following table gives the units of ingredients C and D per kg of compounds A and B as well as minimum requirements of C and D and the cost per kg of A and B. Using the simplex method find the quantities of A and B which would give a supply of C and D of minimum cost.



	Ingredient	Compound		Minimum Requirement
		A	B	
	C	1	2	80
	D	3	1	75
	Cost per kg	4	6	

Module – 4

12. a) Apply the principle of duality to solve the LPP

$$\text{Min } Z = 2x_1 + x_2$$

$$\text{Subject to } 3x_1 + x_2 \geq 3,$$

$$4x_1 + 3x_2 \geq 6,$$

$$x_1 + 2x_2 \geq 3,$$

$$x_1, x_2 \geq 0$$

b) Solve the following TP

		To					Available
		W1	W2	W3	W4	W5	
From	F1	3	4	6	8	9	20
	F2	2	10	1	5	8	30
	F3	7	11	20	40	3	15
	F4	2	1	9	14	16	13
Required		40	6	8	18	6	

13. a) Solve the following TP

		W1	W2	W3	W4	Capacity
	F1	19	30	50	10	7
	F2	70	30	40	60	9
	F3	40	8	70	20	18
Requirement		5	8	7	14	

b) Solve the following AP

	I	II	III	IV	V
A	1	3	2	3	6
B	2	4	3	1	5
C	5	6	3	4	6
D	3	1	4	2	2
E	1	5	6	5	4