



# MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

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## University Examinations 2015/2016

SECOND YEAR FIRST SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL  
ENGINEERING

### SME 2200: ENGINEERING MATHEMATICS III

DATE: NOVEMBER 2015

TIME: 1½ HOURS

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INSTRUCTIONS: Answer question *one* and any other *two* questions

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#### QUESTION ONE (30 MARKS)

- a) Differentiate between discrete data and continuous data . (2 Marks)
- b) Find the mean and median of the given set of data  
5,6,10,12,14,17,23,30 (3 Marks)
- c) Fifteen percent of castings are found to be outside prescribed tolerances. Determine the number of acceptable items likely to be present in a batch of 120 such castings. (3 Marks)
- d) Evaluate:  
(i)  ${}^{10}P_4$  (3 Marks)  
(ii)  ${}^{10}C_6$  (3 Marks)
- e) A die is rolled five times. Use binominal distribution to determine the probability of obtaining three sixes. (3 Marks)
- f) For the given set of values 3,6,7,8,11 and 13  
Find:  
(i) Variance (2 Marks)
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- (ii) Standard deviation. (2 Marks)
- g) Twelve per cent of a batch of transistors are defective. Determine the binomial distribution that a packet of five transistors will contain up to 5 defectives. Calculate the mean and standard deviation of the distribution. (3 Marks)
- h) Define hypothesis (1 Marks)
- i) Differentiate between null and alternative hypothesis (2 Marks)
- j) The masses of 80 castings were determined with the following results:

Mass x (kg)	7.3	7.4	7.5	7.6	7.7	7.8
Frequency f	4	13	21	23	14	5

Calculate the:

- (i) Mean (1 Mark)
- (ii) Standard deviation (2 Marks)

### QUESTION TWO (15 MARKS)

- a) A box contains 100 copper plugs, 27 of which are oversize and 16 undersize. A plug is taken from the box, tested but not replaced: a second plug is then similarly treated. Determine the probability that:
- (i) Both plugs are acceptable. (3 Marks)
- (ii) The first is oversize and the second undersize (3 Marks)
- (iii) One is oversize and the other undersize (4 Marks)
- b) The mean of a binomial distribution is 40 and standard deviation is 6. Calculate n, p and q. (3 Marks)
- c) How many numbers of two different digits can be formed with the figures 1,2,3,4,5,6 (2 Marks)

### QUESTION THREE (15 MARKS)

- a) State the poisson probability function. (2 Marks)
- b) A machine produces on average 2% defectives. In a random sample of 60 items, determine the probability of there being three defectives. (5 Marks)
- c) A box contains five  $10\Omega$  resistors and twelve  $30\Omega$  resistors. The resistors are all unmarked and of the same physical size.

- (i) If one resistor is picked out at random, determine the probability of its resistance being  $10\Omega$  (2 Marks)
- (ii) If this first resistor is found to be  $10\Omega$  and it is retained on one side, find the probability that a second selected resistor will be of  $30\Omega$  resistance (3 Marks)
- d) A variable  $x$  follows a poisson distribution with mean 6. Calculate (Given that  $e^{-6} = 0.00248$ )
- (i)  $P(x=0)$  (1 Mark)
- (ii)  $P(x>2)$  (2 Marks)

**QUESTION FOUR (15 MARKS)**

- a) Calculate the regression equation of  $x$  on  $y$  and  $y$  on  $x$  from the following data using Least square method (10 Marks)

x	1	2	3	4	5
y	2	5	3	8	7

- b) Define the term independent event. (1 Mark)
- c) A candidate is selected for interview of management trainees for 3 companies. For the first company there are 12 candidates, for the second there are 15 candidates and for the third there are 10 candidates. What are the chances of his getting at least at one of the company? (4 Marks)

**QUESTION FIVE (15 MARKS)**

- a) Measurement of the lengths of 50 brass rods gave the following frequency distribution.

Length (x) (mm)	Frequency (f)	Central value	Relative frequency
3.45-3.47	2		
3.48-3.50	6		
3.51-3.53	12		
3.54-3.56	14		
3.57-3.59	10		
3.60-3.62	5		
3.63-3.65	1		

Calculate:

- (i) The central value (3 Marks)
  - (ii) The relative frequency. (3 Marks)
  - (iii) Draw the relative frequency histogram. (5 Marks)
- b) City residents were surveyed recently to determine readership of newspapers available 50% of the residents read the morning paper 60% read the evening paper and 20% read both newspapers. Find the probability that a resident selected reads either the morning or evening paper or both the papers. (4 Marks)