

**EXAM:** Matematisk statistik och diskret matematik D (MVE055/MSG810)

**Time and place:** Wednesday 27 August 2014, em, V.

**Jour:** Alexey Lindo, tel. 0763278070

**Aids:** Chalmers approved calculator and at most one (double-sided) A4 page of own notes.

**Grades:** Maximal points : 10. You must score at least 3 points on this exam. For the final grade your score here will be combined with scores from the VLE tests on scale 3: 12 points, 4: 18 points, 5: 24 points.

**Motivations:** All answers/solutions must be motivated.

**Language:** You may write your answers in either english or swedish.

1. (2p) Provide a definition of moment generating function and find the generating function of sequence  $\{0 = 0^3 + 0, 2 = 1^3 + 1, 10 = 2^3 + 2, 30 = 3^3 + 3, 68 = 4^3 + 4, \dots\}$ .
2. (3p) Let  $\xi$  and  $\eta$  be independent random variables with cumulative distribution functions  $F$  and  $G$  respectively. Find the distribution functions of the following random variables:
  - a)  $\max\{\xi, \eta\}$ ;
  - b)  $\min\{\xi, \eta\}$ ;
  - c)  $\max\{2\xi, \eta\}$ .
3. (2.5p) Markov chain (MC) is fully defined by its matrix of transition probabilities and initial distribution. Can MC be fully defined by an initial distribution and a two-step transition probability matrix?
4. (2.5p) Let  $X_1, \dots, X_n$  be independent and identically distributed random variables with the uniform distribution on  $[0, \theta]$ .

*Hint:* The probability density function of  $Uni[0, \theta]$  is

$$f(x) = \begin{cases} \frac{1}{\theta} & \text{for } 0 \leq x \leq \theta, \\ 0 & \text{otherwise.} \end{cases}$$

Find the method of moments estimate of  $\theta$  and its mean and variance.

Lycka till! Good luck!