

**Math. 3 Midterm Exam.**  
**2<sup>nd</sup> Year Electrical Eng.**  
**November 14<sup>th</sup>, 2018. Allowed Time: 75 Minutes.**



Name:	Class:	Model A
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**Question 1 (10 Marks)**

(A) Evaluate in terms of the Gamma function

$$\int_0^{\sqrt{2}} \frac{dx}{\sqrt{4 + x^4}}.$$

**[4 Marks]**

(B) Find and classify all the singularities of the following differential equation, hence, find its general solution in powers of  $x$ .

$$(1 - x^2) y'' - 2x y' + 12y = 0.$$

**[6 Marks]**

Name:	Class:	Model A
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**Question 2 (10 Marks)**

**Part A.**

Two honest dice are rolled once. Let  $E$  = getting "odd outcome on the first die",  $F$  = getting "odd outcome on the second die", and  $G$  = getting "odd sum of both dice".

Check independence of  $E$ ,  $F$ , and  $G$ .

[2 Marks]

**Part B.**

Five balls are to be selected at random from a collection of 7 White, 6 Black, and 4 Green balls. Find the probability that the all selected balls are of the same color if we are:

- (i) Sampling with replacement                      (ii) sampling without replacement.

[3 Marks]

**Part C.**

- (i) Three machines A, B, and C produce respectively 35%, 25%, 40% of the total production of an item. The probabilities of producing a defective item on these machines are 0.03, 0.04, and 0.02, respectively. An item is chosen at random. Find the probability that it was found non-defective.

[2 Marks]

- (ii) Three events  $E$ ,  $F$  &  $G$  are defined on the sample space  $S$ , such that:  $P(E)=0.3$ ,  $P(F)=0.33$ ,  $P(G)=0.54$ ,  $P(E \cap F)=0.1$ ,  $P(E \cap G)=0.11$ ,  $P(F \cap G)=0.08$ ,  $P(E \cap F \cap G)=0.03$ . Find the probability that:

- (a) Exactly one event will occur.                      (b) At least one event will occur.

[3 Marks]

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Name:	Class:	Model B
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**Question 1 (10 Marks)**

(A) Evaluate in terms of the Gamma function

$$\int_0^{\sqrt{3}} \frac{dx}{\sqrt{9 + x^4}}.$$

**[4 Marks]**

(B) Find and classify all the singularities of the following differential equation, hence, find its general solution in powers of  $x$ .

$$(1 - x^2) y'' - 2x y' + 6y = 0.$$

**[6 Marks]**

Name:	Class:	Model B
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**Question 2 (10 Marks)**

**Part A.**

Two honest dice are rolled once. Let E = getting "odd outcome on the first die", F = getting "odd outcome on the second die", and G = getting "even sum of both dice".

Check independence of E, F, and G.

**[2 Marks]**

**Part B.**

Five balls are to be selected at random from a collection of 4 yellow, 6 Black, and 8 Green balls. Find the probability that the all selected balls are of the same color if we are:

- (i) Sampling with replacement                      (ii) sampling without replacement.

**[3 Marks]**

**Part C.**

- (i) Three machines A, B, and C produce respectively 35%, 25%, 40% of the total production of an item. The probabilities of producing a defective item on these machines are 0.05, 0.03, and 0.04, respectively. An item is chosen at random. Find the probability that it was found non-defective.

**[2 Marks]**

- (ii) Three events  $E$ ,  $F$  &  $G$  are defined on the sample space  $S$ , such that:  $P(E) = 0.35$ ,  $P(F) = 0.42$ ,  $P(G) = 0.55$ ,  $P(E \cap F) = 0.13$ ,  $P(E \cap G) = 0.15$ ,  $P(F \cap G) = 0.12$ ,  $P(E \cap F \cap G) = 0.05$ . Find the probability that:

- (b) Exactly one event will occur.                      (b) At least one event will occur.

**[3 Marks]**