**XX**

**Birla Institute of Technology and Science, Pilani (Raj.)**

**Second Semester, 2015-16**

**MATH F113 (Probability and Statistics)**

**Mid Semester Examination (CLOSED BOOK)**

**Note :**

**(i)** Question Paper is divided into two parts, **PART A** and **PART B**. **PART A** consist of multiple choice questions and **PART B** is descriptive.

**(ii) PART B** question paper will be given only after submission of **PART A.**

**(iii)** Rough work should be done at the end of answer book provided and finally it should be crossed.

**(iv)** Write your name and ID number in the space given in PART A.

**(v)** There are **TEN** questions in **PART A.** Write the most appropriate answer in the box provided below and nowhere else.Each **correct answer** carries **3 marks** and **wrong answer (1)** mark. **Overwriting/cutting will carry ZERO credit.**

**PART A (Closed Book)**

**Max. Marks: 30 Max. Time: 30 minutes Date: March 17, 2016 (Thursday)**

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| --- | --- |
| **ID No.** | **Name** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Q.No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Ans. | C | A | B | A | B | C | B | A | B | D |

Q1. A fair die with faces 1, 2, 3 coloured green and faces 4, 5, 6 coloured red is tossed once. If you can see that the die has green face up, then the probability of an even number, is

A) 1/3 B) 2/3 C) 1/6 D) none of these.

Q2. A safety device in a laboratory is set to activate an alarm if it registers 2 or more radioactive particles within one second. If the average number of radiations is 3 per minute, then the probability that the alarm will be activated within a given one second is

A) 0.6253 B) 0.0902 C) 0.3935 D) none of these.

Q3. You have three coins in your pocket: out of these one coin is biased with probability of heads 'p' and rest two coins are fair. If one coin is selected randomly and tossed, falling heads up, then the probability that selected coin being fair is

A) 1/p B) 1/(1+p) C) p/(1+p) D) none of these.

Q.4 If A and B are two independent events such that P(A**ʹ**) = 0.7, P(B**ʹ**) = **p** and P(A ∪ B) = 0.8, then **p** is

A) 1 B) 5/7 C) 2/7 D) none of these.

P.T.O.

Q5. If X is a random variable such that E[X] = 4 and E[X2] = 20, then the lower bound for P[2 < X < 10] is

A) 8/9 B) 2/3 C) 1/9 D) none of these.

Q6. Customers arrive randomly at a bank teller's window. Let X, the arrival of customer, have a uniform distribution on the interval [2, 10], then P[2 < X < 8] is

A) 3/4 B) 1/2 C) 1/4 D) none of these.

Q7. Five cards are randomly selected without replacement from an ordinary deck of playing cards. If X denote the number of hearts in the sample, then the expected value of X is

A) 1/13 B) 5/13 C) 5/4 D) none of these.

Q8. The probability that a cancer patient will survive for 10 years after proper treatment is 0.50. If 12 cancer patients are properly treated, then the probability that at least one patient will survive for 10 years, is

A) 0.0029 B) 0.9998 C) 0.0002 D) 0.9971

Q9. If X is the number of points rolled with a balanced die, then Var (12X) is

A) 35/3 B) 35/12 C) 35/4 D) none of these.

Q10. The consumption of petrol in small cars is normally distributed, with mean 15.5 liters and standard deviation of 2.5 liters. The probability that the consumption of petrol is 20.4 liters or more is

A) 0.975 B) 0.029 C) 0.05 0 D) 0.025

**(Use Z0.025 = 1.96, Z0.05 = 1.645, Z0.9706 =1.89, Z0.0294 = 1.89, Z0.9901 = 2.33, Z0.009 = 2.365)**

\*\*\*\*\*END\*\*\*\*\*

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**II SEMESTER 2015-16**

**MATH F113 (PROBABILITY AND STATISTICS)**

**Mid Semester Examination (CLOSED BOOK)**

**PART B**

**Note : (i) Define events and random variables as and when required.**

**(ii) Each subpart of a particular question should be answered in continuation**.

**MAX. MARKS: 75 DURATION: 60 MINUTES DATE: 17/03/2016 (Thursday)**

**Q1.** **(a)** The Probability that a student passes a Physics test is  and the probability that he passes the both a Physics and English test is . The probability that he passes at least one test is . What is the probability that he does not pass the English test? **(8)**

**(b)** One shot is fired from each of the three guns, ,, and denote the events that the target is hit by the first, second and third guns respectively. If & and , , are independent events, find the probability that exactly one hit is registered. **(10)**

**Q2. (a)** Two tennis players A and B are scheduled to play a match. The winner is the first player to win three sets in a total that cannot exceed five sets. The event that player A wins any one set is independent of the event that he/she wins any other set. The probability that player A wins any one set is equal to 0.6. Let *X* be the total number of sets played in the match; i.e. *X* = 3, 4, 5. Prepare a table for probability density function of *X* and find the expected number of sets required to complete the match.  **(13)**

**(b)** Without using moment generating function, derive an expression for expectation of a random variable *X* following Poisson distribution with parameter *k*. (**6)**

**Q3. (a)** The density function of a continuous random variable *X* is given by

where *a*, *b*, *c* are constants.

Show that and , where and . **(15)**

**(b)** The time (in hours) required to repair a machine is exponentially distributed with parameter ** = 2. What is the probability that the repair time exceeds 2 hours? **(4)**

**Q4.** Overbooking of passengers on intercontinental flights is a common practice among airlines. Aircraft which are capable of carrying 300 passengers are booked to carry 320 passengers. If on average 10% of passengers who have a booking fail to turn up for their flights, what is the approximate probability that at least one passenger who has a booking will end up without a seat on a particular flight? **(19)**

**(Use Z0.025 = 1.96, Z0.05 = 1.645, Z0.9706 = 1.89, Z0.0294 = 1.89 , Z0.9901 = 2.33, Z0.009 = 2.365)**

**-------Good Luck-------**