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PBB-003-001322

Seat No. _____

B. Sc. (Sem. III) (CBCS) Examination

November / December - 2018

Statistics : Paper - 301

(Old Course)

Faculty Code : 003

Subject Code : 001322

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) Q.1 carries 20 marks.
(2) Q.2 and Q.3 carry 25 marks each.
(3) Student can use their own scientific calculator.

1 Filling the blanks and short questions : (Each **1** mark) **20**

(1) If $nP_3 = 720$ then value of n = _____.

(2) Classical probability concept was given by _____.

(3) Two events are mutually exclusive if there is _____ in between them.

(4) Classical probability is not calculable if the _____ number of outcomes is not countable.

(5) Two events A and B are equal if _____ and _____.

(6) The probability based on the concept of relative frequency is called _____ or _____.

(7) Probability can never be less than _____.

(8) If $B \subset A$, then $P(A\overline{B})$ is _____ or _____.

(9) If A and B are two events, then $P(\overline{A} \cap B)$ is _____.

(10) If $P(A) = p_1, P(B) = p_2$ and $P(A \cap B) = p_3$, then $P(\overline{A} \cup \overline{B})$ = _____.

(11) A discrete variable can take a _____ number of values within its range.

(12) The probability density function $f(x)$ cannot exceed _____.

(13) The first moment about mean is always _____.

(14) The measure of Kurtosis β_2 = _____.

(15) For leptokurtic curve β_2 _____ ; γ_2 _____.

(16) If $p = q = \frac{1}{2}$ then Binomial distribution is _____.

(17) If $x_1 \sim B(p, n_1)$ and $x_2 \sim B(p, n_2)$ two independent Binomial variates then $x_1 + x_1 \sim$ _____.

(18) If Poisson distribution $p(x) = \frac{e^{-4}4^x}{x!}$; $x = 0, 1, 2, \ldots$ then variance are _____.

(19) Negative Binomial distribution $NB(r, p)$ reduces to Geometric distribution when _____.

(20) Within 2σ limits, the area under a normal curve is _____.

2 (a) Write the answer any **three** : (Each 2 marks) **6**

(1) Define Equally events with example.

(2) Prove that $P(A' \cap B) = P(B) - P(A \cap B)$ for any two events A and B.

(3) Define Bernoulli distribution and write its mean and variance.

(4) Obtain moment generating function of Negative Binomial distribution.

(5) Prove that ${}^nC_r + {}^nC_{(r-1)} = {}^{(n+1)}C_r$.

(6) For a Poisson variate $3p(x = 2) = p(x = 4)$. Find mean and variance.

(b) Write the answer any **three** : (Each 3 marks) **9**

(1) If X and Y are two continuous random variables then prove that $E(X + Y) = E(X) + E(Y)$ provided all the expectations exit.

(2) Obtain relation between r^{th} central moment and r^{th} raw moment. Also obtain relation between first four central moment and raw moment.

(3) Obtain moment generating function of Binomial distribution. Also obtain mean and variance of Binomial distribution from it.

(4) Define Hyper Geometric distribution and also find its mean.

(5) There are 2 white and 4 black balls in the box. A person selects 3 balls at random from the box. If he gets 10 rupees for each white ball and 5 rupees for each black balls. Find expected amount he gets with white balls.

(6) Probability of getting head when a coin is tossed is 1/2. A person tosses a coin continuously. Find the probability of getting 6^{th} head at 10^{th} trial. Also find the mean and variance of number of trials before getting 6^{th} head.

(c) Write the answer any **two** : (Each 5 marks) **10**

(1) For Binomial distribution prove that

$$k_{(r+1)} = pq\frac{dk_r}{dp}.$$

(2) For Poisson distribution prove that

$$\mu_{(r+1)} = rm\,\mu_{(r-1)} + m\frac{d\mu_r}{dm}$$

(3) Prove that Poisson distribution is limiting case of the Binomial distribution.

(4) The following is distribution of number of accidents occurred in a city during 100 days. Fit a proper distribution to the given data :

No. of accidents	0	1	2	3	4 or more
No. of days	37	36	19	6	2

(5) The average height of a group of soldiers is 68.22 inches and the variance of height is 10.89 inches. Out of 1000 soldiers how many solders do you expect to be at least 6 feet tall ?

3 (a) Write the answer any **three** : (Each 2 marks) **6**

(1) Define Mutually exclusive events with example.

(2) If A and B are any two events (subset of sample space S) and are not disjoint, then prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.

(3) Define Mathematical Expectation and also write any three properties of it.

(4) Obtain moment generating function of Geometric distribution.

(5) If ${}^{12}C_5 + 2\left({}^{12}C_4\right) + {}^{12}C_3 = {}^{14}C_x$ then find the value of x.

(6) The probability that a person can hit a target in any trial is 0.7. Find the probability that he will hit the target for the first time at 4^{th} trial.

(b) Write the answer any **three** : (Each 3 marks) **9**

(1) If X and Y are two independent continuous random variables then prove that $E(XY) = E(X)E(Y)$ provided all the expectations exit.

(2) If X_1, X_2, X_3, ..., X_n be n random variables then

$$V\left(\sum_{i=1}^{n} a_i X_i\right) = \sum_{i=1}^{n} a_i^2\, V\left(X_i\right) + 2\sum_{i=1}^{n}\sum_{\substack{j=1 \\ i<j}}^{n} a_i a_j Cov\left(X_i, X_j\right)$$

(3) Obtain moment generating function of Negative Binomial distribution. Also obtain mean and variance of Negative Binomial distribution from it.

(4) Obtain central moment generating function of Poisson distribution. Also obtain first four central moment from it.

(5) A machine is made of 2 parts A and B the probability that part A is defective is 0.05 and the probability that part B is defective is 0.07 find the probability that the entire machine is not defective.

(6) For Binomial distribution $n = 6$ and $9p(x = 4) = p(x = 2)$ find value of parameter p.

(c) Write the answer any **two** : (Each 5 marks) **10**

(1) For Binomial distribution prove that

$$\mu_{(r+1)} = pq\left[nr\mu_{(r-1)} + \frac{d\mu_r}{dp}\right]$$

(2) Obtain relation between cumulants and moments. Also show that $\mu_4 = k_4 + 3k_2^2$.

(3) A car is parked among N cars in a row, not at either end. On his return the owner finds that exactly of the N places are still occupied. What is the probability that both neighboring place are empty ?

(4) The probability that a patient will get reaction of a particular injection is 0.001. 2000 patients are given that injection. Find the probability that

(i) 3 patient will get reaction

(ii) more than 2 patients will get reaction.

(5) In a Normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution.
