Iqra National University, Peshawar
Department of Electrical Engineering

Final – Term Examination Summer 2020
Date:22/09/2020

Course Code:				**Course Title:**	Probability Methods in Engineering		
Prerequisite:				**Instructor:**	Engr. Pir Meher Ali Shah		
Module:	3	**Program:**	BEE	**Total Marks:**	50	**Time Allowed:**	120 min

Note: Attempt all questions. PLO: program learning outcome C: Cognitive

Q1.	(a)	In a certain "junior" Olympics, javelin throw distances are well approximated by a gaussian distribution for which $a_x = 30m$, and $\sigma_x = 5m$. In a qualifying round, contestant must throw farther than 26m to qualify. In the main even the record throw is 42m. a. What is the probability of being disqualified in the qualifying round? b. In the main event what is the probability the record will be broken?	**Marks 6** CLO 2
	(b)	The radial distance to the impact points for the shells fired over land by a cannon is well approximated as a gaussian Random Variable with a_x = 1800m and σ_X = 80m when the cannon is aimed at a target located at 1980m distance. a) Find the probability that the shells will fall within ± 68m of the target. b) Find the probability that the shells will fall at distances of 2050m or more	**Marks 6** CLO 2
	(c)	Find a constant b > 0 so that the function $$f_x(x) = \begin{cases} \frac{e^{5x}}{8} & 0 \le x \le b \\ 0 & elsewhere \end{cases}$$ Is a valid probability density?	**Marks 6** CLO 2
Q2	(a)	A certain large city averages 3 murders per week and their occurrence follow a Poisson Distribution. i. What is the probability that there will be 5 or more murders in a given week? ii. On average, how many weeks a year can this city expect to have no murders iii. How many weeks/year (average) can the city expect the number of murders per week equal to or exceed the average number per week	**Marks 8** CLO 2
	(b)	A random variable X has the distribution function $$F_x(x) = \sum_{n=1}^{N} \frac{n^3}{650} u(x-n)$$ Find the following probabilities. a. P {-∞ < X ≤ 6.5} b. P {X > 4} c. P {6 < X ≤ 9}	**Marks 8** CLO 2

	(c)	Find the Binomial Density and Distribution Function for N=5 and p = 0.25. Also Plot their Densities and Distribution Functions.	**Marks 6** CLO 2
Q 3	(a)	Find the Expected value of the function $\mathbf{g(X) = X^3}$ where X is a random variable defined by the following density function $$\boldsymbol{f_X(x) = \left(\frac{1}{2}\right) u(x) e^{-x/2}}$$	**Marks 6** CLO 2
	(b)	Person A, B and C each toss a fair coin in a two-step gambling game. In step 1 the person whose toss is not a match to either of the other two is "odd man out". Only the remaining two whose coins match go on to step 2 to resolve the ultimate winner. i. What is the probability you will advance to step 2 after the first toss? ii. What is the probability that person A will be out after the first toss?	**Marks 4** CLO 2