UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course	: Probability and Statistics for Engineers	Semester	: 3
Program	: BCA (All Specializations)	Time	: 03 hrs.
Course Code : CSEG 2036P		Max. Marks : 100	

Instructions: Use of non-programmable calculator is allowed.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Differentiate between the theoretical and statistical probability.	4	CO1
Q 2	Discuss your understanding of mutually exhaustive and independent events using suitable examples.	4	CO1
Q 3	Describe covariance between two random variable. If the given random variables are independent, compute the covariance between them.	4	CO4
Q 4	State the significance of moment generating function.	4	CO3
Q 5	Explain how the regression can explore nondeterministic relationship between the variables.	4	CO4

SECTION B
(4Qx10M= 40 Marks)

Q 6	a) A power plant will shut down if systems S1 and S2 or S1 and S3 fails simultaneously. The systems S1, S2, and S3 are independent and their probabilities of failure are 0.02, 0.015, and 0.025 respectively. Compute the probability that the plant will shut down. b) A company producing electric relays has three manufacturing plants producing 50, 30, and 20 percent respectively of its product. Suppose the probabilities that a relay manufactured by these plants is defective are 0.02, 0.05, and 0.01 respectively. Compute the probability that a relay is defective if it is selected at random from the output of the company.	10	CO1
Q 7	a) The average number of traffic accidents on a certain section of a highway is two per week. Assume that the number of accidents follows a Poisson distribution. Find the probability that no accident occur in a week. b) The probability of success of a certain experiment is 0.02. Find the number of trials in order that the probability of at least one success is greater than 1/2.	10	CO3

Q 8	a) The daily consumption of milk in excess of 20,000 litre is approximately distributed as Gamma variable with parameters $k=2$, $\lambda=10^{-4}$. If Dehradun has a daily stock of 30,000 litre on a given day, find the probability that the stock is insufficient. b) An electric firm manufactures light bulbs that have a length of life which is normally distributed with $\mu=800$ hrs and $\sigma=40$ hrs. Find the probability that a bulb burns between 778 and 834 hrs.	10	CO3
Q 9	Describe probit analysis using suitable example. **OR** Discuss your understanding of discriminant function analysis in group classification.	10	CO5

SECTION-C
(2Qx20M=40 Marks)

Q 10	Define the following terms using suitable examples (wherever applicable): a) Covariance of two random variable b) Joint moment generating function c) Characteristic function d) Conditional mean and conditional variance e) Chebyshev Inequality	20	CO2

Q 11	a) In a correlation analysis, the equations of the two regression lines are $3x+12y = 19$; and $3y+9x = 46$. Compute
	
	  i. The value of the correlation coefficient.
	  ii. Mean value of X and Y.
	
	(10 Marks)
	b) If X and Y are uncorrelated random variables with variances 16 and 9. Find the correlation coefficient between X+Y and X-Y.
	(10 Marks)
	OR
	
	A company's trainees are randomly divided into three groups of 10 each and are given a course in management skills by three different methods. At the end of the training period, they are given a test and their scores are as follows:
	
	<table><tr><td>Method A</td><td>99</td><td>64</td><td>101</td><td>85</td><td>79</td><td>88</td><td>97</td><td>95</td><td>90</td><td>100</td></tr><tr><td>Method B</td><td>83</td><td>102</td><td>125</td><td>61</td><td>91</td><td>96</td><td>94</td><td>89</td><td>93</td><td>75</td></tr><tr><td>Method C</td><td>89</td><td>98</td><td>56</td><td>105</td><td>87</td><td>90</td><td>87</td><td>101</td><td>76</td><td>89</td></tr></table>
	
	Use Kruskal-Wallis test to determine at 5% level of significance if the three method are equally effective.
	(20 Marks)
		20	CO4