UNIVERSITY OF RUHUNA

Master of Business Management Degree Program

First Semester End Examination 2018 October

MBM 11033 Business Mathematics and Statistics

Answer all questions.

Time : 03 Hours

Total Marks 60

01.

a). Find the first derivative for each of the following functions.

i. $f(x)=6x^5$

ii. $f(x)=2x+9$

iii. $f(x)=(8x-9)(4x^5)$

iv. $f(x)=\dfrac{8x^2+3x-9}{7x^2-4}$

(08 marks)

b). Among a group of students, 50 played cricket, 50 played hockey and 40 played volley ball. 5 played both cricket and hockey, 10 played both hockey and volley ball, 5 played cricket and volley ball and 10 played all three. If 10 students do not play any of these given sports, find the total number of students, how many played only cricket, only hockey and volley ball?

(04 marks)

(Total 12 marks)

02.

a). What do you mean by a diagonal matrix?

(01 mark)

b). Given

$$A=\begin{bmatrix}3 & 2 & 4\\ 5 & -3 & 2\end{bmatrix} \qquad B=\begin{bmatrix}3 & 4 & 5\\ -2 & 1 & 0\end{bmatrix}$$

Find

i. $A+B$

ii. $A-B$

iii. $4\,(A+B)$

(03 marks)

c). Solve the following system of equations by using matrices.

$$\begin{aligned} -x+2y+3z&=8\\ x-4y-7z&=4\\ -x+2y+5z&=6 \end{aligned}$$

(08 marks)

(Total 12 marks)

03.

a). Assume that if you invest Rs. 50000 today, you will receive Rs. 75000 in exactly 5 years. Calculate the discount rate.

(02 marks)

b). When you were born, your uncle promised to deposit Rs. 5000 in a saving account for you on each and every one of your birthdays, beginning with your first. The savings account bears seven percent (7%) compound annual rate of interest. You have just turned 25 and want all the cash. However, it turns out that your uncle made no deposits on your fifth, seventh, and eleventh birthdays. How much is in the account now on your twenty fifth birthday?

(05 marks)

c). Suppose you borrow Rs. 75000 at 12% compound annual interest to be repaid over the next five years. Equal installment payments are required at the end of each year.

i. Determine the annual payment

ii. Prepare the amortization schedule for the above loan.

(05 marks)

(Total 12 marks)

04.

a). Why is the standard deviation the most widely used measure of dispersion? Briefly explain.

(02 marks)

b). The daily earnings of employees in a garment factory are compared with those in a construction company showing in the table given below.

Daily earnings (Rs.)	**Number of employees**	
	Garment Factory	**Construction Company**
1000 – 1500	20	10
1500 – 2000	56	18
2000 – 2500	71	39
2500 – 3000	45	46
3000 – 3500	17	42
3500 – 4000	12	33
4000 - 4500	08	25
4500 - 5000	03	11

i. Calculate the arithmetic mean, median and standard deviation of daily earnings for each of the two companies.

(06 marks)

ii. Determine the coefficient of variation for each of the two companies.

(02 marks)

iii. Which company shows greater variability in the distribution of daily earnings?

(02 marks)

(Total 12 marks)

05.

a). In a Bulb manufacturing Factory, out of the total output 25%, 35% and 40% of the items are produced respectively by machines A, B and C. It is found that the machines A,B and C produce respectively 5%, 4% and 2% defective items in their productions. A bulb is selected at random and is found to be defective.

Find the probability that the item was manufactured by,

i. Machine A
ii. Machine B
iii. Machine C

(04 marks)

b). A fair coin is tossed five times, considering the binomial distribution, find the probability of

i. Exactly two heads
ii. At least three heads
iii. At most three heads

(03 marks)

c). The number of accidents in a year attributed to taxi drivers in a city follows poisson distribution with mean 3. Out of 1000 taxi drivers, find approximately the number of drivers with

i. No accident in a year
ii. More than three accident in a year

(02 marks)

d). The average monthly sales of 5,000 firms are normally distributed. Its mean and standard deviation are Rs.36,000 and Rs.10, 000 respectively. You are required to find.

i. The number of firms the sales of which are over Rs.40,000
ii. The percentage of firms the sales of which are between Rs 37,000 and Rs.42, 000.
iii. The number of firms the sales of which are between Rs 20,000 and Rs 43.000.

(03 marks)

(Total 12 marks)

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NORMAL DISTRIBUTION

The table gives the area under the normal curve between the mean and a point z standard deviations above the mean.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	4982	4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	4987	4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Appendix Table 4(b) Poisson Probabilities

					λ					
k	.005	.01	.02	.03	.04	.05	.06	.07	.08	.09
0	.9950	.9900	.9802	.9704	.9608	.9512	.9418	.9324	.9231	.9139
1	.0050	.0099	.0192	.0291	.0384	.0476	.0565	.0653	.0738	.0823
2	.0000	.0000	.0002	.0004	.0008	.0012	.0017	.0023	.0030	.0037
3	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0001	.0001

					λ					
k	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0	.9048	.8187	.7408	.6703	.6065	.5488	.4966	.4493	.4066	.3679
1	.0905	.1637	.2222	.2681	.3033	.3293	.3476	.3595	.3659	.3679
2	.0045	.0164	.0333	.0536	.0758	.0988	.1217	.1438	.1647	.1839
3	.0002	.0011	.0033	.0072	.0126	.0198	.0284	.0383	.0494	.0613
4	.0000	.0001	.0002	.0007	.0016	.0030	.0050	.0077	.0111	.0153
5	.0000	.0000	.0000	.0001	.0002	.0004	.0007	.0012	.0020	.0031
6	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0002	.0003	.0005
7	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0001

					λ					
k	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
0	.3329	.3012	.2725	.2466	.2231	.2019	.1827	.1653	.1496	.1353
1	.3662	.3614	.3543	.3452	.3347	.3230	.3106	.2975	.2842	.2707
2	.2014	.2169	.2303	.2417	.2510	.2584	.2640	.2678	.2700	.2707
3	.0738	.0867	.0998	.1128	.1255	.1378	.1496	.1607	.1710	.1804
4	.0203	.0260	.0324	.0395	.0471	.0551	.0636	.0723	.0812	.0902
5	.0045	.0062	.0084	.0111	.0141	.0176	.0216	.0260	.0309	.0361
6	.0008	.0012	.0018	.0026	.0035	.0047	.0061	.0078	.0098	.0120
7	.0001	.0002	.0003	.0005	.0008	.0011	.0015	.0020	.0027	.0034
8	.0000	.0000	.0001	.0001	.0001	.0002	.0003	.0005	.0006	.0009
9	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0001	.0001	.0002

					λ					
k	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
0	.1225	.1108	.1003	.0907	.0821	.0743	.0672	.0608	.0550	.0498
1	.2572	.2438	.2306	.2177	.2052	.1931	.1815	.1703	.1596	.1494
2	.2700	.2681	.2652	.2613	.2565	.2510	.2450	.2384	.2314	.2240
3	.1890	.1966	.2033	.2090	.2138	.2176	.2205	.2225	.2237	.2240
4	.0992	.1082	.1169	.1254	.1336	.1414	.1488	.1557	.1622	.1680
5	.0417	.0476	.0538	.0602	.0668	.0735	.0804	.0872	.0940	.1008
6	.0146	.0174	.0206	.0241	.0278	.0319	.0362	.0407	.0455	.0504
7	.0044	.0055	.0068	.0083	.0099	.0118	.0139	.0163	.0188	.0216
8	.0011	.0015	.0019	.0025	.0031	.0038	.0047	.0057	.0068	.0081
9	.0003	.0004	.0005	.0007	.0009	.0011	.0014	.0018	.0022	.0027
10	.0001	.0001	.0001	.0002	.0002	.0003	.0004	.0005	.0006	.0008

(Contd.)

$$FVA_n = R\left[\sum_{t=1}^{n}(1+i)^{n-t}\right]$$

$$FVA_n = R\left[\frac{(1+i)^n - 1}{i}\right]$$

$$FVAD_n = R(FVIFA_{i,n})(i+i)$$

$$FVAD_n = R\left[\frac{(1+i)^n - 1}{i}\right](1+i)$$

$$PVA_n = R\left[\sum_{t=1}^{n}\frac{1}{(1+i)^t}\right]$$

$$PVA_n = \frac{R}{i}\left[1 - \frac{1}{(1+i)^n}\right]$$

$$PVAD_n = (1+i)\frac{R}{i}\left[1 - \frac{1}{(1+i)^n}\right]$$

$$PV = C \times \frac{1}{(r-g)}\left(1 - \left(\frac{1+g}{(1+r)}\right)^N\right)$$