



**JARAMOGI OGINGA ODONGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**SCHOOL OF BUSINESS & ECONOMICS**  
**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF BUSINESS**  
**ADMINISTRATION WITH IT/ BACHELOR OF EDUCATION ARTS WITH IT/**  
**BACHELOR OF EDUCATION SPECIAL NEEDS**  
**1<sup>ST</sup> YEAR 1<sup>ST</sup> SEMESTER 2024/2025 ACADEMIC YEAR**  
**MAIN / KISUMU CAMPUS**

---

**COURSE CODE: BAB 1104**

**COURSE TITLE: MANAGEMENT MATHEMATICS I**

**EXAM VENUE:**

**STREAM: (BBA/BED ARTS/SNE)**

**DATE: 24/04/2025**

**EXAM SESSION: 9.00 – 11.00 AM**

**TIME: 2 HOURS**

---

**Instructions:**

- 1. Answer QUESTION ONE and any other TWO questions**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

### **QUESTION ONE (30 MARKS)- COMPULSORY**

- a. (i) Using relevant examples, differentiate Singleton from an Empty set as used in set theory:

(4 marks)

(ii) Given that  $A = \{a, b\}$ ,  $B = \{c, d\}$ ,  $C = \{b, d\}$ .

Verify that:  $A \cap (B \cup C) \neq (A \cap B) \cup C$

(5 marks)

- b. Assume that consumption  $C$  depends on income  $Y$  according to the function  $C = a + bY$ , where  $a$  and  $b$  are parameters. If  $C$  is £600 when  $Y$  is £400 and  $C$  is £900 when  $Y$  is £800,

Required:

i. the values of the parameters  $a$  and  $b$ ?

(4 marks)

ii. the value of  $C$  if  $Y = £550$

(2 marks)

- c. Mr. Natendechere expects to receive the following amounts of income at the end of each year for the next three years

Year	Ksh
1	280,000,000
2	166,000,000
3	150,000,000

How much is this worth in terms of present value if his rate of time preference is 10% and the amounts are discounted at this rate

(5 marks)

- d. (i). Differentiate between Domain and Range

(2 marks)

(ii). Given that  $f(x, y, z) = \frac{2xy - 5z + 3}{3}$ , find  $f(-2, 4, 1)$

(3 marks)

- e. A project  $P$  costs US \$ 100,000 to invest in and is expected to pay back US \$100,000 in year one and US \$20,000 in year two and nothing thereafter.

Required:

Determine the project's Internal Rate of Return

(IRR)

(5 marks)

### **QUESTION TWO (20 MARKS)**

- a. If  $U = \{a, b, c, d, e, f, g, h, p, q, t\}$  is a universal set,  $A = \{a, b, c, d\}$ ,  $B = \{b, d, e, f\}$  and  $D = \{a, f, g, p, q, r\}$ , find,

i.  $T \setminus A$

(1 mark)

ii.  $A^c \cap B^c$

(3 marks)

iii.  $(A \cap B) \cup D$

(2 marks)

- b. (i) What is Power set?

(1 mark)

(ii) Determine the power set of  $B$  in (a) above

(3 marks)

- c. Out of three sports Rugby, football and Hockey, 240 students were asked to state their preferences. 120 preferred football, 172 preferred rugby and 128 preferred hockey. 64 preferred rugby and football, 76 preferred rugby and hockey and 68 preferred football and hockey.

Required:

- i. Present the above information using a venn diagram (4 marks)
- ii. the number of students who preferred all the three sports (2 marks)
- iii. The number of students preferred at least 2 sports (2 marks)
- iv. The number of students who preferred only one sport (2 marks)

### QUESTION THREE (20MARKS)

Consider the following investment projects each of which needs an initial outlay of Kshs1,200,000 but give different net cash flows. The cost of capital is 20%

Year	1	2	3	4	5	6
Project X	350,000	400,000	450,000	250,000	400,000	100,000
Project Y	200,000	400,000	550,000	150,000	200,000	120,000

Required:

- a) Determine the payback period (PBP) for each of these investment projects and state which project will be favoured by this method and why? (7marks)
- b) Calculate the net present value (NPV) of each project and state which project will be undertaken and why? (9 marks)
- c) State four disadvantages of PBP as method of investment project appraisal (4 marks)

### QUESTION FOUR (20 MARKS)

- a) A group of students start a small company that produces Cakes. Their weekly profit is defined by a quadratic function of the form :  $P(x) = ax^2 + bx + c$  where x is the number of cakes sold.

Given that when they sell 10 cakes, their profit is Kshs400, when they sell 20 cakes their profit is Kshs1800 and when they sell 25 cakes their profit is Kshs2650

Required:

- i. The profit function (8 marks)
- ii. The profit when they sell 120 cakes (2 marks)

- (b) Research has shown that output  $Y$  of a firm is related to labour ( $L$ ) and capital ( $K$ ) as follows.

$$Y = aL + bK + cKL.$$

From previous observations, the following was recorded: the output was 1610 when labour was 9 units and capital was 4 units; the output was 2100 when labour was 10 units and capital 5 units. Finally output was 3260 when labour was 12 units and capital 7 units  
Required:

- i. Formulate a 3x3 system of linear equations (3 marks)
- ii. Solve the system of linear equations (6 marks)
- iii. Write the function of output in terms of labour and capital (1 mark)

**QUESTION FIVE (20 MARKS)**

- (a) (i) Differentiate between compounding and discounting. (2 marks)

- (ii) Hence highlight any three differences between FVIF and PVIF (3 marks)

(iii) Your younger sister has just won Ksh. 200,000 in “Mavuno Tele” promotion and plans to invest the amount immediately. Two options are available for her. Either deposit in Bank A which attracts 12% interest compounded semiannually or bank B which attracts an interest of 8% compounded monthly. Advise her on the best investment option. (7 marks)

- (c) (i) What is an annuity? (2 marks)

(ii) Suppose you are planning for education of your son and you discover that you will have to meet your son’s tuition payments for a self-sponsored program in medicine at the University at a cost of Ksh.650, 000 p.a for the next six years. You therefore wish to deposit enough money today in an investment whose interest rate is 5% p.a. to meet your son’s tuition payments. How much will you deposit today/now in lumpsome to meet this obligation?

(6 marks)

## Present Value Table (PVIF)

i. Present value of 1 i.e.  $PVIF = (1 + r)^{-n}$

Where r = discount rate

n = number of periods until payment

period (n)	<i>Discount rate (r)</i>									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
(n)	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.074	0.065

## Present Value of Annuity Table

$$\text{Present value of an annuity of 1 i.e. PVIFA} = \frac{1-(1+r)^{-n}}{r}$$

Where r = discount rate  
n = number of periods

ii.		Discount Rate (r %)									
Period (n)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	
<b>1</b>	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	
<b>2</b>	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736	
<b>3</b>	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487	
<b>4</b>	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170	
<b>5</b>	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791	
<b>6</b>	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355	
<b>7</b>	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868	
<b>8</b>	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335	
<b>9</b>	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759	
<b>10</b>	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145	
<b>11</b>	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495	
<b>12</b>	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814	
<b>13</b>	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103	
<b>14</b>	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367	
<b>15</b>	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606	
<b>(n)</b>	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%	
<b>1</b>	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833	
<b>2</b>	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528	
<b>3</b>	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106	
<b>4</b>	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589	
<b>5</b>	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991	
<b>6</b>	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326	
<b>7</b>	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605	
<b>8</b>	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837	
<b>9</b>	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031	
<b>10</b>	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192	
<b>11</b>	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327	
<b>12</b>	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439	
<b>13</b>	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533	
<b>14</b>	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611	
<b>15</b>	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675	

**Table 1 - Future value interest factors for single cash flows. Formula:  $FV = (1 + k)^n$** 

Period (n) / per cent (k)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%
1	1.0100	1.0200	1.0300	1.0400	1.0500	1.0600	1.0700	1.0800	1.0900	1.1000	1.1100
2	1.0201	1.0404	1.0609	1.0816	1.1025	1.1236	1.1449	1.1664	1.1881	1.2100	1.2321
3	1.0303	1.0612	1.0927	1.1249	1.1576	1.1910	1.2250	1.2597	1.2950	1.3310	1.3676
4	1.0406	1.0824	1.1255	1.1699	1.2155	1.2625	1.3108	1.3605	1.4116	1.4641	1.5181
5	1.0510	1.1041	1.1593	1.2167	1.2763	1.3382	1.4026	1.4693	1.5386	1.6105	1.6851
6	1.0615	1.1262	1.1941	1.2653	1.3401	1.4185	1.5007	1.5869	1.6771	1.7716	1.8704
7	1.0721	1.1487	1.2299	1.3159	1.4071	1.5036	1.6058	1.7138	1.8280	1.9487	2.0762
8	1.0829	1.1717	1.2668	1.3686	1.4775	1.5938	1.7182	1.8509	1.9926	2.1436	2.3045
9	1.0937	1.1951	1.3048	1.4233	1.5513	1.6895	1.8385	1.9990	2.1719	2.3579	2.5580
10	1.1046	1.2190	1.3439	1.4802	1.6289	1.7908	1.9672	2.1589	2.3674	2.5937	2.8394
11	1.1157	1.2434	1.3842	1.5395	1.7103	1.8983	2.1049	2.3316	2.5804	2.8531	3.1518
12	1.1268	1.2682	1.4258	1.6010	1.7959	2.0122	2.2522	2.5182	2.8127	3.1384	3.4985
13	1.1381	1.2936	1.4685	1.6651	1.8856	2.1329	2.4098	2.7196	3.0658	3.4523	3.8833
14	1.1495	1.3195	1.5126	1.7317	1.9799	2.2609	2.5785	2.9372	3.3417	3.7975	4.3104
15	1.1610	1.3459	1.5580	1.8009	2.0789	2.3966	2.7590	3.1722	3.6425	4.1772	4.7846
16	1.1726	1.3728	1.6047	1.8730	2.1829	2.5404	2.9522	3.4259	3.9703	4.5950	5.3109
17	1.1843	1.4002	1.6528	1.9479	2.2920	2.6928	3.1588	3.7000	4.3276	5.0545	5.8951
18	1.1961	1.4282	1.7024	2.0258	2.4066	2.8543	3.3799	3.9960	4.7171	5.5599	6.5436
19	1.2081	1.4568	1.7535	2.1068	2.5270	3.0256	3.6165	4.3157	5.1417	6.1159	7.2633
20	1.2202	1.4859	1.8061	2.1911	2.6533	3.2071	3.8697	4.6610	5.6044	6.7275	8.0623
21	1.2324	1.5157	1.8603	2.2788	2.7860	3.3996	4.1406	5.0338	6.1088	7.4002	8.9492
22	1.2447	1.5460	1.9161	2.3699	2.9253	3.6035	4.4304	5.4365	6.6586	8.1403	9.9336
23	1.2572	1.5769	1.9736	2.4647	3.0715	3.8197	4.7405	5.8715	7.2579	8.9543	11.0263
24	1.2697	1.6084	2.0328	2.5633	3.2251	4.0489	5.0724	6.3412	7.9111	9.8497	12.2392
25	1.2824	1.6406	2.0938	2.6658	3.3864	4.2919	5.4274	6.8485	8.6231	10.8347	13.5855