UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2008/2009

April/May 2009

EBS 339/3 – Mineral Economics
[Ekonomi Mineral]

Duration : 3 hours
[Masa : 3 jam]

Please ensure that this examination paper contains <u>ELEVEN</u> printed pages and THREE pages APPENDIX before you begin the examination.
[Sila pastikan bahawa kertas peperiksaan ini mengandungi <u>SEBELAS</u> muka surat yang bercetak dan TIGA muka surat LAMPIRAN sebelum anda memulakan peperiksaan ini.]

This paper contains FOUR questions from PART A and THREE questions from PART B.
[Kertas soalan ini mengandungi EMPAT soalan dari BAHAGIAN A dan TIGA soalan dari BAHAGIAN B.]

Instruction: Answer **TWO** questions from PART A, **TWO** questions from PART B and **ONE** question from any part. If candidate answers more than five questions only the first five questions answered in the answer script would be examined.
*[**Arahan**: Jawab **DUA** soalan dari BAHAGIAN A, **DUA** soalan dari BAHAGIAN B dan **SATU** soalan dari mana-mana bahagian. Jika calon menjawab lebih daripada lima soalan hanya lima soalan pertama mengikut susunan dalam skrip jawapan akan diberi markah.]*

Answer to any question must start on a new page.
[Mulakan jawapan anda untuk setiap soalan pada muka surat yang baru.]

You may answer a question either in Bahasa Malaysia or in English.
[Anda dibenarkan menjawab soalan sama ada dalam Bahasa Malaysia atau Bahasa Inggeris.]

PART A / *BAHAGIAN A*

1.   [a]   The 2nd National Mineral Policy that has been launched recently with a theme "Towards Sustainable Mining" is based on nine (9) main thrusts. Name three (3) and discuss briefly.

Dasar Mineral Negara ke-2 yang dilancarkan baru-baru ini dengan bertemakan "Ke Arah Perlombongan Mapan" adalah berlandaskan kepada sembilan (9) teras utama. Nyatakan 3 (tiga) daripadanya dan bincangkan secara ringkas.

(4 marks/*markah*)

   [b]   Explain the following types of investment appraisal:
   (i)   Net Present Value (NPV)
   (ii)   Internal Rate of Return (IRR)
   (iii)   Discounted Cash Flow (DCF)

Terangkan jenis-jenis penilaian pelaburan yang berikut:
   (i)   Nilai Kini Bersih
   (ii)   Kadar Pulangan Dalaman
   (iii)   Aliran Tunai Terdiskaun

(6 marks/*markah*)

   [c]   Explain and discuss the effect of change in metal price on mining operations.

Bincangkan kesan perubahan harga logam dalam operasi perlombongan.

(5 marks/*markah*)

[d]   Detailed evaluation in a mine is not possible due to factors occur during preparation of the appraisal. Explain the factors that occur during the evaluation.

Penilaian yang jitu sesuatu lombong adalah tidak mungkin kerana berbagai-bagai faktor terlibat semasa menyediakan penilaian tersebut. Terangkan faktor-faktor tersebut.

(5 marks/*markah*)

2.   [a]   Explain how to determine the Total Capital Cost for a new mining project.

Terangkan bagaimana anda boleh menentukan Jumlah Kos Modal untuk projek perlombongan baru.

(6 marks/*markah*)

[b]   What is "Working Capital" and how you can prepare fund for it?

Apakah "Modal Kerja" dan bagaimana anda membuat peruntukan untuknya?

(6 marks/*markah*)

[c]   What is mutually exclusive project? Explain.

Apakah projek saling menyingkiri? Terangkan.

(4 marks/*markah*)

[d]   Align the negative cash flow shown below if the capital cost is 10%:

Laraskan aliran tunai negatif berikut jika kos modal ialah 10%:

Table 1 / *Jadual 1*

Year / Tahun	0	1 ke 5	6	7	8	9
Cash Flow / Aliran Tunai	-2000	1000	1100	1250	-2500	1000

(4 marks/*markah*)

3.   Cash flow for a mining project are as given in the following table:

Unjuran aliran tunai untuk satu projek perlombongan adalah seperti berikut:

Table 2 / *Jadual 2*

Year / Tahun	Capital Expenditure / Perbelanjaan Modal (RM 000)	Gross Income / Pendapatan Kasar (RM 000)	Operating Cost / Kos Operasi (RM 000)	Depletion / Pemupusan (RM 000)
-2	1,000			
-1	3,000			
0	6,000		-	
1		8,000	4,000	600
2		11,000	4,000	600
3		13,000	4,500	600
4		12,000	4,500	600
5		10,000	5,000	600

30% of the capital expenditure is to buy mining land while the remainder is used to develop the mining operation until production.

30% daripada perbelanjaan modal adalah untuk pemilikan tanah perlombongan dan bakinya digunakan untuk pembangunan lombong itu sehingga peringkat pengeluaran.

If:-

(i) The depreciation was done equally for 4 years.

(ii) Royalty are paid at 5% of gross revenue.

(iii) Income tax are paid at 35%.

(iv) Capital cost is 10%.

Andainya :-

(i) Susut nilai sepenuhnya dilaksanakan sama rata selama 4 tahun.

(ii) Royalti dibayar pada kadar 5% ke atas pendapatan kasar.

(iii) Cukai pendapatan dibayar pada kadar 35%.

(iv) Kos modal adalah 10%.

Calculate / *Kirakan:*

[a] The total net income cash flow for the project.

Jumlah aliran tunai bersih untuk projek.

(8 marks/*markah*)

[b] The net cash flow present value at capital cost.

Nilai kini aliran tunai bersih pada kos modal.

(6 marks/*markah*)

[c] The discounted cash flow internal rate of return for the project.

Kadar pulangan dalaman aliran tunai terdiskaun untuk projek.

(4 marks/*markah*)

[d] The payback period.

Tempoh bayar balik aliran tunai tersebut.

(2 marks/*markah*)

4. A company that involves in quarrying activities and production of limestone products has decided to increase their production due to high market demand. After analyzing a few options, the company finally decided to focus only at two proposed cash flow. Proposal A needs capital investment of 5 million ringgit and will generate annual net cash flow of 1 million ringgit for 10 years. Proposal B needs capital investment of 606 million ringgit and will generate annual net cash flow of 1.3 million ringgit for 10 years. If the capital cost is 10%, which proposal should be accepted? Give reasons.

Sebuah syarikat yang terlibat dalam pengkuarian dan pengeluaran produk–produk berasaskan batu kapur mengambil keputusan untuk meningkatkan pengeluaran kerana permintaan pasaran yang bertambah. Setelah meneliti beberapa pilihan, pihak syarikat akhirnya menumpukan pertimbanganya kepada dua cadangan aliran tunai. Cadangan A memerlukan pelaburan modal sebanyak 5 juta ringgit dan menghasilkan aliran tunai masuk bersih tahunan sebanyak 1 juta ringgit selama 10 tahun. Cadangan B memerlukan pelaburan modal sebanyak 606 juta ringgit dan menghasilkan aliran tunai masuk bersih tahunan sebanyak 1.3 juta ringgit selama 10 tahun. Jika kos modal adalah 10%, cadangan yang manakah yang anda pilih? Berikan sebab-sebab atas cadangan anda itu.

(20 marks/*markah*)

PART B / BAHAGIAN B

5. [a] Discuss the factors which might affect **mineral production costs** which need to be considered in the planning phase for the development of a new mine or quarry site.

   *Terangkan semua faktor-faktor yang mungkin akan mempengaruhi **kos keluaran mineral** dalam fasa perancangan perkembangan industri mineral di tapak baru.*

   (10 marks/*markah*)

   [b] Describe the phases which need to be considered in the design and planning of a new open pit mine or quarry site.

   Bincangkan fasa-fasa yang perlu dilaksanakan dalam proses rekabentuk misalnya kawasan lombong dedah atau tapak kuari.

   (10 marks/*markah*)

6. [a] Discuss, with the aid of diagrams, the steps required in the determination of 'average grade' for the following deposit using the **traditional statistical techniques** as follows:

(i)   Polygonal technique,

(ii)   Triangular technique.

Huraikan fasa-fasanya, dengan bantuan gambarajah, bagaimana 'gred purata' dapat ditentukan di kawasan yang berikut dengan menggunakan kaedah-kaedah statistik yang berkenaan:

(i)   kaedah Penilaian Poligon,

(ii) ⁼   kaedah Segitiga.
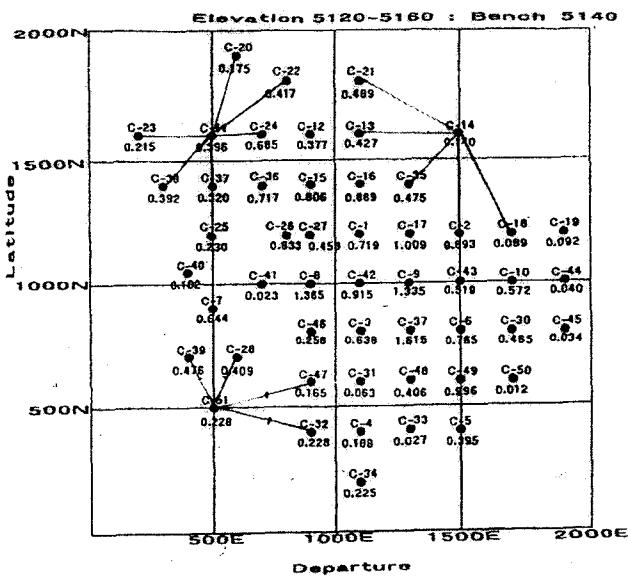
Present your views on the **advantages and limitations** of the above ore evaluation techniques.

*Berikan pandangan anda atas **kelebihan dan kekurangan** dalam kegunaan kaedah penilaian rizab tersebut.*

(15 marks/*markah*)

[b] Describe and discuss the various types of **sampling grids** commonly used in the industry for ore reserve evaluation and give your opinion on the benefits and limitations of the various types you have listed.

*Terangkan dan huraikan pelbagai **jenis grid sampelan** yang biasa digunakan dalam industri untuk penilaian rizab mineral and berikan pandangan anda tentang kelebihan dan kekurangan setiap jenis sistem grid yang anda telah senaraikan.*

(5 marks/*markah*)

7. [a] Elaborate on the various phases required and the results expected at each phase for the grade evaluation of a mineral site using the **Geostatistical technique.**

*Huraikan **fasa-fasa Geostatistik** yang perlu dilaksanakan, dan hasil bagi setiap fasa, untuk penilaian rizab mineral untuk tapak mineral yang berpotensi.*

(10 marks/*markah*)

[b] Using the **Global Estimation Technique** determine the 'Surface Area (S^*)', 'Standard Deviation (σ_s)' and calculate the Range of the estimated surface area for the following mineral deposit:

*Dengan kegunaan **Kaedah Anggaran Sejagat** kirakan nilai 'luas permukaan (S^*)', 'sisihan piawai (σ_s)' dan tentukan julat luasnya untuk endapan mineral yang berikut:*
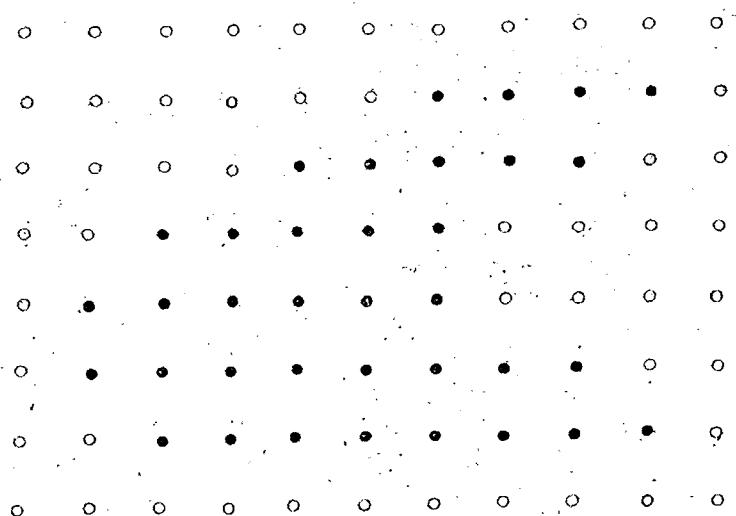
[grid size/ distance between samples = 1000 m]

● Mineral-positive site   O Barren site (No mineral)

(10 marks/*markah*)

(FAKTOR PENDISKAUNAN)

NILAI KINI UNTUK 1 PADA KADAR $r\% = (1 + r)^{-n}$

								TAHUN								
n r	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1%	0.9901	0.9803	0.9706	0.9610	0.9515	0.9420	0.9327	0.9235	0.9143	0.9053	0.8963	0.8874	0.8787	0.8700	0.8613	0.8528
2%	0.9804	0.9612	0.9423	0.9238	0.9057	0.8880	0.8706	0.8535	0.8368	0.8203	0.8043	0.7885	0.7730	0.7579	0.7430	0.7284
3%	0.9709	0.9426	0.9151	0.8885	0.8626	0.8375	0.8131	0.7894	0.7664	0.7441	0.7224	0.7014	0.6810	0.6611	0.6419	0.6232
4%	0.9615	0.9246	0.8890	0.8548	0.8219	0.7903	0.7599	0.7307	0.7026	0.6756	0.6496	0.6246	0.6006	0.5775	0.5553	0.5339
5%	0.9524	0.9070	0.8638	0.8227	0.7835	0.7462	0.7107	0.6768	0.6446	0.6139	0.5847	0.5568	0.5303	0.5051	0.4810	0.4581
6%	0.9434	0.8900	0.8396	0.7921	0.7473	0.7050	0.6651	0.6274	0.5919	0.5584	0.5268	0.4970	0.4688	0.4423	0.4173	0.3936
7%	0.9346	0.8734	0.8163	0.7629	0.7130	0.6663	0.6227	0.5820	0.5439	0.5083	0.4751	0.4440	0.4150	0.3878	0.3624	0.3387
8%	0.9259	0.8573	0.7938	0.7350	0.6806	0.6302	0.5835	0.5403	0.5002	0.4632	0.4289	0.3971	0.3677	0.3405	0.3152	0.2919
9%	0.9174	0.8417	0.7722	0.7084	0.6499	0.5963	0.5470	0.5019	0.4604	0.4224	0.3875	0.3555	0.3262	0.2992	0.2745	0.2519
10%	0.9091	0.8264	0.7513	0.6830	0.6209	0.5645	0.5132	0.4665	0.4241	0.3855	0.3505	0.3186	0.2897	0.2633	0.2394	0.2176
11%	0.9009	0.8116	0.7312	0.6587	0.5935	0.5346	0.4817	0.4339	0.3909	0.3522	0.3173	0.2858	0.2575	0.2320	0.2090	0.1883
12%	0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523	0.4039	0.3606	0.3220	0.2875	0.2567	0.2292	0.2046	0.1827	0.1631
13%	0.8850	0.7831	0.6931	0.6133	0.5428	0.4803	0.4251	0.3762	0.3329	0.2946	0.2607	0.2307	0.2042	0.1807	0.1599	0.1415
14%	0.8772	0.7695	0.6750	0.5921	0.5194	0.4556	0.3996	0.3506	0.3075	0.2697	0.2366	0.2076	0.1821	0.1597	0.1401	0.1229
15%	0.8696	0.7561	0.6575	0.5718	0.4972	0.4323	0.3759	0.3269	0.2843	0.2472	0.2149	0.1869	0.1625	0.1413	0.1229	0.1069
16%	0.8621	0.7432	0.6407	0.5523	0.4761	0.4104	0.3538	0.3050	0.2630	0.2267	0.1954	0.1685	0.1452	0.1252	0.1079	0.0930
17%	0.8547	0.7305	0.6244	0.5337	0.4561	0.3898	0.3332	0.2848	0.2434	0.2080	0.1778	0.1520	0.1299	0.1110	0.0949	0.0811
18%	0.8475	0.7182	0.6086	0.5158	0.4371	0.3704	0.3139	0.2660	0.2255	0.1911	0.1619	0.1372	0.1163	0.0985	0.0835	0.0708
19%	0.8403	0.7062	0.5934	0.4987	0.4190	0.3521	0.2959	0.2487	0.2090	0.1756	0.1476	0.1240	0.1042	0.0876	0.0736	0.0618
20%	0.8333	0.6944	0.5787	0.4823	0.4019	0.3349	0.2791	0.2326	0.1938	0.1615	0.1346	0.1122	0.0935	0.0779	0.0649	0.0541
21%	0.8264	0.6830	0.5645	0.4665	0.3855	0.3186	0.2633	0.2176	0.1799	0.1486	0.1228	0.1015	0.0839	0.0693	0.0573	0.0474
22%	0.8197	0.6719	0.5507	0.4514	0.3700	0.3033	0.2486	0.2038	0.1670	0.1369	0.1122	0.0920	0.0754	0.0618	0.0507	0.0415
23%	0.8130	0.6610	0.5374	0.4369	0.3552	0.2888	0.2348	0.1909	0.1552	0.1262	0.1026	0.0834	0.0678	0.0551	0.0448	0.0364
24%	0.8065	0.6504	0.5245	0.4230	0.3411	0.2751	0.2218	0.1789	0.1443	0.1164	0.0938	0.0757	0.0610	0.0492	0.0397	0.0320
25%	0.8000	0.6400	0.5120	0.4096	0.3277	0.2621	0.2097	0.1678	0.1342	0.1074	0.0859	0.0687	0.0550	0.0440	0.0352	0.0281
26%	0.7937	0.6299	0.4999	0.3968	0.3149	0.2499	0.1983	0.1574	0.1249	0.0992	0.0787	0.0625	0.0496	0.0393	0.0312	0.0248
27%	0.7874	0.6200	0.4882	0.3844	0.3027	0.2383	0.1877	0.1478	0.1164	0.0916	0.0721	0.0568	0.0447	0.0352	0.0277	0.0218
28%	0.7813	0.6104	0.4768	0.3725	0.2910	0.2274	0.1776	0.1388	0.1084	0.0847	0.0662	0.0517	0.0404	0.0316	0.0247	0.0193
29%	0.7752	0.6009	0.4658	0.3611	0.2799	0.2170	0.1682	0.1304	0.1011	0.0784	0.0607	0.0471	0.0365	0.0283	0.0219	0.0170
30%	0.7692	0.5917	0.4552	0.3501	0.2693	0.2072	0.1594	0.1226	0.0943	0.0725	0.0558	0.0429	0.0330	0.0254	0.0195	0.0150
31%	0.7634	0.5827	0.4448	0.3396	0.2592	0.1979	0.1510	0.1153	0.0880	0.0672	0.0513	0.0392	0.0299	0.0228	0.0174	0.0133
32%	0.7576	0.5739	0.4348	0.3294	0.2495	0.1890	0.1432	0.1085	0.0822	0.0623	0.0472	0.0357	0.0271	0.0205	0.0155	0.0118
33%	0.7519	0.5653	0.4251	0.3196	0.2403	0.1807	0.1358	0.1021	0.0768	0.0577	0.0434	0.0326	0.0245	0.0185	0.0139	0.0104
34%	0.7463	0.5569	0.4156	0.3102	0.2315	0.1727	0.1289	0.0962	0.0718	0.0536	0.0400	0.0298	0.0223	0.0166	0.0124	0.0093
35%	0.7407	0.5487	0.4064	0.3011	0.2230	0.1652	0.1224	0.0906	0.0671	0.0497	0.0368	0.0273	0.0202	0.0150	0.0111	0.0082
36%	0.7353	0.5407	0.3975	0.2923	0.2149	0.1580	0.1162	0.0854	0.0628	0.0462	0.0340	0.0250	0.0184	0.0135	0.0099	0.0073
37%	0.7299	0.5328	0.3889	0.2839	0.2072	0.1512	0.1104	0.0806	0.0588	0.0429	0.0313	0.0229	0.0167	0.0122	0.0089	0.0065
38%	0.7246	0.5251	0.3805	0.2757	0.1998	0.1448	0.1049	0.0760	0.0551	0.0399	0.0289	0.0210	0.0152	0.0110	0.0080	0.0058
39%	0.7194	0.5176	0.3724	0.2679	0.1927	0.1386	0.0997	0.0718	0.0516	0.0371	0.0267	0.0192	0.0138	0.0099	0.0072	0.0051
40%	0.7143	0.5102	0.3644	0.2603	0.1859	0.1328	0.0949	0.0678	0.0484	0.0346	0.0247	0.0176	0.0126	0.0090	0.0064	0.0046
41%	0.7092	0.5030	0.3567	0.2530	0.1794	0.1273	0.0903	0.0640	0.0454	0.0322	0.0228	0.0162	0.0115	0.0081	0.0058	0.0041
42%	0.7042	0.4959	0.3492	0.2459	0.1732	0.1220	0.0859	0.0605	0.0426	0.0300	0.0211	0.0149	0.0105	0.0074	0.0052	0.0037
43%	0.6993	0.4890	0.3420	0.2391	0.1672	0.1169	0.0818	0.0572	0.0400	0.0280	0.0196	0.0137	0.0096	0.0067	0.0047	0.0033
44%	0.6944	0.4823	0.3349	0.2326	0.1615	0.1122	0.0779	0.0541	0.0376	0.0261	0.0181	0.0126	0.0087	0.0061	0.0042	0.0029
45%	0.6897	0.4756	0.3280	0.2262	0.1560	0.1076	0.0742	0.0512	0.0353	0.0243	0.0168	0.0116	0.0080	0.0055	0.0038	0.0026
46%	0.6849	0.4691	0.3213	0.2201	0.1507	0.1032	0.0707	0.0484	0.0332	0.0227	0.0156	0.0107	0.0073	0.0050	0.0034	0.0023
47%	0.6803	0.4628	0.3148	0.2142	0.1457	0.0991	0.0674	0.0459	0.0312	0.0212	0.0144	0.0098	0.0067	0.0045	0.0031	0.0021
48%	0.6757	0.4565	0.3085	0.2084	0.1408	0.0952	0.0643	0.0434	0.0294	0.0198	0.0134	0.0091	0.0061	0.0041	0.0028	0.0019
49%	0.6711	0.4504	0.3023	0.2029	0.1362	0.0914	0.0613	0.0412	0.0276	0.0185	0.0124	0.0084	0.0056	0.0038	0.0025	0.0017
50%	0.6667	0.4444	0.2963	0.1975	0.1317	0.0878	0.0585	0.0390	0.0260	0.0173	0.0116	0.0077	0.0051	0.0034	0.0023	0.0015

(FAKTOR PENGKOMPAUNAN)

r \ n	TAHUN															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1%	1.010	1.020	1.030	1.041	1.051	1.062	1.072	1.083	1.094	1.105	1.116	1.127	1.138	1.149	1.161	1.173
2%	1.020	1.040	1.061	1.082	1.104	1.126	1.149	1.172	1.195	1.219	1.243	1.268	1.294	1.319	1.346	1.373
3%	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	1.344	1.384	1.426	1.469	1.513	1.558	1.605
4%	1.040	1.082	1.125	1.170	1.217	1.265	1.316	1.369	1.423	1.480	1.539	1.601	1.665	1.732	1.801	1.873
5%	1.050	1.103	1.158	1.216	1.276	1.340	1.407	1.477	1.551	1.629	1.710	1.796	1.886	1.980	2.079	2.183
6%	1.060	1.124	1.191	1.262	1.338	1.419	1.504	1.594	1.689	1.791	1.898	2.012	2.133	2.261	2.397	2.540
7%	1.070	1.145	1.225	1.311	1.403	1.501	1.606	1.718	1.838	1.967	2.105	2.252	2.410	2.579	2.759	2.952
8%	1.080	1.166	1.260	1.360	1.469	1.587	1.714	1.851	1.999	2.159	2.332	2.518	2.720	2.937	3.172	3.426
9%	1.090	1.188	1.295	1.412	1.539	1.677	1.828	1.993	2.172	2.367	2.580	2.813	3.066	3.342	3.642	3.970
10%	1.100	1.210	1.331	1.464	1.611	1.772	1.949	2.144	2.358	2.594	2.853	3.138	3.452	3.797	4.177	4.595
11%	1.110	1.232	1.368	1.518	1.685	1.870	2.076	2.305	2.558	2.839	3.152	3.498	3.883	4.310	4.785	5.311
12%	1.120	1.254	1.405	1.574	1.762	1.974	2.211	2.476	2.773	3.106	3.479	3.896	4.363	4.887	5.474	6.130
13%	1.130	1.277	1.443	1.630	1.842	2.082	2.353	2.658	3.004	3.395	3.836	4.335	4.898	5.535	6.254	7.067
14%	1.140	1.300	1.482	1.689	1.925	2.195	2.502	2.853	3.252	3.707	4.226	4.818	5.492	6.261	7.138	8.137
15%	1.150	1.323	1.521	1.749	2.011	2.313	2.660	3.059	3.518	4.046	4.652	5.350	6.153	7.076	8.137	9.358
16%	1.160	1.346	1.561	1.811	2.100	2.436	2.826	3.278	3.803	4.411	5.117	5.936	6.886	7.988	9.266	10.748
17%	1.170	1.369	1.602	1.874	2.192	2.565	3.001	3.511	4.108	4.807	5.624	6.580	7.699	9.007	10.539	12.330
18%	1.180	1.392	1.643	1.939	2.288	2.700	3.185	3.759	4.435	5.234	6.176	7.288	8.599	10.147	11.974	14.129
19%	1.190	1.416	1.685	2.005	2.386	2.840	3.379	4.021	4.785	5.695	6.777	8.064	9.596	11.420	13.590	16.172
20%	1.200	1.440	1.728	2.074	2.488	2.986	3.583	4.300	5.160	6.192	7.430	8.916	10.699	12.839	15.407	18.488
21%	1.210	1.464	1.772	2.144	2.594	3.138	3.797	4.595	5.560	6.727	8.140	9.850	11.918	14.421	17.449	21.114
22%	1.220	1.488	1.816	2.215	2.703	3.297	4.023	4.908	5.987	7.305	8.912	10.872	13.264	16.182	19.742	24.086
23%	1.230	1.513	1.861	2.289	2.815	3.463	4.259	5.239	6.444	7.926	9.749	11.991	14.749	18.141	22.314	27.446
24%	1.240	1.538	1.907	2.364	2.932	3.635	4.508	5.590	6.931	8.594	10.657	13.215	16.386	20.319	25.196	31.243
25%	1.250	1.563	1.953	2.441	3.052	3.815	4.768	5.960	7.451	9.313	11.642	14.552	18.190	22.737	28.422	35.527
26%	1.260	1.588	2.000	2.520	3.176	4.002	5.042	6.353	8.005	10.086	12.708	16.012	20.175	25.421	32.030	40.358
27%	1.270	1.613	2.048	2.601	3.304	4.196	5.329	6.768	8.595	10.915	13.862	17.605	22.359	28.396	36.062	45.799
28%	1.280	1.638	2.097	2.684	3.436	4.398	5.629	7.206	9.223	11.806	15.112	19.343	24.759	31.691	40.565	51.923
29%	1.290	1.564	2.147	2.769	3.572	4.608	5.945	7.669	9.893	12.761	16.462	21.236	27.395	35.339	45.587	58.808
30%	1.300	1.690	2.197	2.856	3.713	4.827	6.275	8.157	10.604	13.786	17.922	23.298	30.288	39.374	51.186	66.542
31%	1.310	1.716	2.248	2.945	3.858	5.054	6.621	8.673	11.362	14.884	19.498	25.542	33.460	43.833	57.421	75.221
32%	1.320	1.742	2.300	3.036	4.007	5.290	6.983	9.217	12.166	16.060	21.199	27.983	36.937	48.757	64.359	84.954
33%	1.330	1.769	2.353	3.129	4.162	5.535	7.361	9.791	13.022	17.319	23.034	30.635	40.745	54.190	72.073	95.858
34%	1.340	1.796	2.406	3.224	4.320	5.789	7.758	10.395	13.930	18.666	25.012	33.516	44.912	60.182	80.644	108.063
35%	1.350	1.823	2.460	3.322	4.484	6.053	8.172	11.032	14.894	20.107	27.144	36.644	49.470	66.784	90.158	121.714
36%	1.360	1.850	2.515	3.421	4.653	6.328	8.605	11.703	15.917	21.647	29.439	40.037	54.451	74.053	100.713	136.969
37%	1.370	1.877	2.571	3.523	4.826	6.612	9.058	12.410	17.001	23.292	31.910	43.717	59.892	82.052	112.411	154.003
38%	1.380	1.904	2.628	3.627	5.005	6.907	9.531	13.153	18.151	25.049	34.568	47.703	65.831	90.846	125.368	173.008
39%	1.390	1.932	2.686	3.733	5.189	7.213	10.025	13.935	19.370	26.925	37.425	52.021	72.309	100.510	139.708	194.194
40%	1.400	1.960	2.744	3.842	5.378	7.530	10.541	14.758	20.661	28.925	40.496	56.694	79.371	111.120	155.568	217.795
41%	1.410	1.988	2.803	3.953	5.573	7.858	11.080	15.623	22.028	31.059	43.794	61.749	87.066	122.763	173.096	244.065
42%	1.420	2.016	2.863	4.066	5.774	8.198	11.642	16.531	23.474	33.334	47.334	67.214	95.444	135.530	192.453	273.284
43%	1.430	2.045	2.924	4.182	5.980	8.551	12.228	17.486	25.005	35.757	51.132	73.119	104.561	149.522	213.816	305.757
44%	1.440	2.074	2.986	4.300	6.192	8.916	12.839	18.488	26.623	38.338	55.206	79.497	114.475	164.845	237.376	341.822
45%	1.450	2.103	3.049	4.421	6.410	9.294	13.476	19.541	28.334	41.085	59.573	86.381	125.252	181.615	263.342	381.846
46%	1.460	2.132	3.112	4.544	6.634	9.685	14.141	20.645	30.142	44.008	64.251	93.807	136.958	199.959	291.939	426.232
47%	1.470	2.161	3.177	4.669	6.864	10.090	14.833	21.804	32.052	47.117	69.261	101.814	149.667	220.010	323.415	475.420
48%	1.480	2.190	3.242	4.798	7.101	10.509	15.554	23.019	34.069	50.422	74.624	110.444	163.457	241.916	358.035	529.892
49%	1.490	2.220	3.308	4.929	7.344	10.943	16.304	24.294	36.197	53.934	80.362	119.739	178.411	265.832	396.090	590.174
50%	1.500	2.250	3.375	5.062	7.594	11.391	17.086	25.629	38.443	57.665	86.498	129.746	194.620	291.929	437.894	656.841

(NILAI KINI ANUITI)

NILAI KINI ANUITI UNTUK 1 PADA KADAR $r\% \left[= \dfrac{1 - (1 + r)^{-n}}{r} \right]$

	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.9009	0.8929	0.8850	0.8772	0.8696	0.8621	0.8547
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.7125	1.6901	1.6681	1.6467	1.6257	1.6052	1.5852
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4437	2.4018	2.3612	2.3216	2.2832	2.2459	2.2096
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.1024	3.0373	2.9745	2.9137	2.8550	2.7982	2.7432
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6959	3.6048	3.5172	3.4331	3.3522	3.2743	3.1993
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.2305	4.1114	3.9975	3.8887	3.7845	3.6847	3.5892
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.7122	4.5638	4.4226	4.2883	4.1604	4.0386	3.9224
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	5.1461	4.9676	4.7988	4.6389	4.4873	4.3436	4.2072
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.5370	5.3282	5.1317	4.9464	4.7716	4.6065	4.4506
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.8892	5.6502	5.4262	5.2161	5.0188	4.8332	4.6586
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	6.2065	5.9377	5.6869	5.4527	5.2337	5.0286	4.8364
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.4924	6.1944	5.9176	5.6603	5.4206	5.1971	4.9884
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.7499	6.4235	6.1218	5.8424	5.5831	5.3423	5.1183
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667	6.9819	6.6282	6.3025	6.0021	5.7245	5.4675	5.2293
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061	7.1909	6.8109	6.4624	6.1422	5.8474	5.5755	5.3242
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237	7.3792	6.9740	6.6039	6.2651	5.9542	5.6685	5.4053
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216	7.5488	7.1196	6.7291	6.3729	6.0472	5.7487	5.4746
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014	7.7016	7.2497	6.8399	6.4674	6.1280	5.8178	5.5339
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	7.8393	7.3658	6.9380	6.5504	6.1982	5.8775	5.5845
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	7.9633	7.4694	7.0248	6.6231	6.2593	5.9288	5.6278
21	18.8570	17.0112	15.4150	14.0292	12.8212	11.7641	10.8355	10.0168	9.2922	8.6487	8.0751	7.5620	7.1016	6.6870	6.3125	5.9731	5.6648
22	19.6604	17.6580	15.9369	14.4511	13.1630	12.0416	11.0612	10.2007	9.4424	8.7715	8.1757	7.6446	7.1695	6.7429	6.3587	6.0113	5.6964
23	20.4558	18.2922	16.4436	14.8568	13.4886	12.3034	11.2722	10.3711	9.5802	8.8832	8.2664	7.7184	7.2297	6.7921	6.3988	6.0442	5.7234
24	21.2434	18.9139	16.9355	15.2470	13.7986	12.5504	11.4693	10.5288	9.7066	8.9847	8.3481	7.7843	7.2829	6.8351	6.4338	6.0726	5.7465
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770	8.4217	7.8431	7.3300	6.8729	6.4641	6.0971	5.7662
26	22.7952	20.1210	17.8768	15.9828	14.3752	13.0032	11.8258	10.8100	9.9290	9.1609	8.4881	7.8957	7.3717	6.9061	6.4906	6.1182	5.7831
27	23.5596	20.7069	18.3270	16.3296	14.6430	13.2105	11.9867	10.9352	10.0266	9.2372	8.5478	7.9426	7.4086	6.9352	6.5135	6.1364	5.7975
28	24.3164	21.2813	18.7641	16.6631	14.8981	13.4062	12.1371	11.0511	10.1161	9.3066	8.6016	7.9844	7.4412	6.9607	6.5335	6.1520	5.8099
29	25.0658	21.8444	19.1885	16.9837	15.1411	13.5907	12.2777	11.1584	10.1983	9.3696	8.6501	8.0218	7.4701	6.9830	6.5509	6.1656	5.8204
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737	9.4269	8.6938	8.0552	7.4957	7.0027	6.5660	6.1772	5.8294
31	26.5423	22.9377	20.0004	17.5885	15.5928	13.9291	12.5318	11.3498	10.3428	9.4790	8.7331	8.0850	7.5183	7.0199	6.5791	6.1872	5.8371
32	27.2696	23.4683	20.3888	17.8736	15.8027	14.0840	12.6466	11.4350	10.4062	9.5264	8.7686	8.1116	7.5383	7.0350	6.5905	6.1959	5.8437
33	27.9897	23.9886	20.7658	18.1476	16.0025	14.2302	12.7538	11.5139	10.4644	9.5694	8.8005	8.1354	7.5560	7.0482	6.6005	6.2034	5.8493
34	28.7027	24.4986	21.1318	18.4112	16.1929	14.3681	12.8540	11.5869	10.5178	9.6086	8.8293	8.1566	7.5717	7.0599	6.6091	6.2098	5.8541
35	29.4086	24.9986	21.4872	18.6646	16.3742	14.4982	12.9477	11.6546	10.5668	9.6442	8.8552	8.1755	7.5856	7.0700	6.6166	6.2153	5.8582
36	30.1075	25.4888	21.8323	18.9083	16.5469	14.6210	13.0352	11.7172	10.6118	9.6765	8.8786	8.1924	7.5979	7.0790	6.6231	6.2201	5.8617
37	30.7995	25.9695	22.1672	19.1426	16.7113	14.7368	13.1170	11.7752	10.6530	9.7059	8.8996	8.2075	7.6087	7.0868	6.6288	6.2242	5.8647
38	31.4847	26.4406	22.4925	19.3679	16.8679	14.8460	13.1935	11.8289	10.6908	9.7327	8.9186	8.2210	7.6183	7.0937	6.6338	6.2278	5.8673
39	32.1630	26.9026	22.8082	19.5845	17.0170	14.9491	13.2649	11.8786	10.7255	9.7570	8.9357	8.2330	7.6268	7.0997	6.6380	6.2309	5.8695
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574	9.7791	8.9511	8.2438	7.6344	7.1050	6.6418	6.2335	5.8713
41	33.4997	27.7995	23.4124	19.9931	17.2944	15.1380	13.3941	11.9672	10.7866	9.7991	8.9649	8.2534	7.6410	7.1097	6.6450	6.2358	5.8729
42	34.1581	28.2348	23.7014	20.1856	17.4232	15.2245	13.4524	12.0067	10.8134	9.8174	8.9774	8.2619	7.6469	7.1138	6.6478	6.2377	5.8743
43	34.8100	28.6616	23.9819	20.3708	17.5459	15.3062	13.5070	12.0432	10.8380	9.8340	8.9886	8.2696	7.6522	7.1173	6.6503	6.2394	5.8755
44	35.4555	29.0800	24.2543	20.5488	17.6628	15.3832	13.5579	12.0771	10.8605	9.8491	8.9988	8.2764	7.6568	7.1205	6.6524	6.2409	5.8765
45	36.0945	29.4902	24.5187	20.7200	17.7741	15.4558	13.6055	12.1084	10.8812	9.8628	9.0079	8.2825	7.6609	7.1232	6.6543	6.2421	5.8773
46	36.7272	29.8923	24.7754	20.8847	17.8801	15.5244	13.6500	12.1374	10.9002	9.8753	9.0161	8.2880	7.6645	7.1256	6.6559	6.2432	5.8781
47	37.3537	30.2866	25.0247	21.0429	17.9810	15.5890	13.6916	12.1643	10.9176	9.8866	9.0235	8.2928	7.6677	7.1277	6.6573	6.2442	5.8787
48	37.9740	30.6731	25.2667	21.1951	18.0772	15.6500	13.7305	12.1891	10.9336	9.8969	9.0302	8.2972	7.6705	7.1296	6.6585	6.2450	5.8792
49	38.5881	31.0521	25.5017	21.3415	18.1687	15.7076	13.7668	12.2122	10.9482	9.9063	9.0362	8.3010	7.6730	7.1312	6.6596	6.2457	5.8797
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617	9.9148	9.0417	8.3045	7.6752	7.1327	6.6605	6.2463	5.8801