University of Asia pacific
Department of Civil Engineering
Final Examination Spring 2016
Program: MCE

Course Title: Transportation Planning | Course Code: CE 6510
Time: 3 Hours | Full Marks: 150

There are **six** questions. Answer any **five** of them.

1. a) Name the methods of calculating Trip Distribution of an area. 5
   b) Trip productions and attractions, travel time between zones for a 3 zone study area are given as follows: 20

Trip production-attraction

Zone	1	2	3	Total
Trip Production	145	335	285	765
Trip Attraction	305	270	190	765

Travel time between zones (min)

Zone	1	2	3
1	6	4	3
2	2	5	6
3	3	7	5

Travel time vs Friction factor

Time (min)	F value
1	82
2	48
3	45
4	41
5	37
6	28
7	22
8	15

Determine the number of trips between each zone using Gravity Model. Assume Socio-economic factor 1.

   c) What are the Limitations of Gravity Model? 5

2. a) Concisely discuss the basic road patterns. 10
   b) What are the advantages and disadvantages of grid pattern of street network? 6
   c) Briefly describe the benefits of walking and bicycling. 8
   d) What are the difficulties faced by pedestrian during using sidewalks in Dhaka city? 6

3. a) What are the purposes of Transport Demand Analysis? 6
   b) Define Transportation System Management. 5
   c) List some Transport Demand Management (TDM) schemes to reduce congestion in city streets. Describe any three of the TDM schemes. 12

d) What are the techniques of Transportation System Management from Supply Side? 7

4. a) What are the factors that affect the mode choice of the travelers? 6

b) A standardization equation developed the following utility function: 18

$$u_k = a_k - 0.03X_1 - 0.025\,X_2 - 0.022\,X_3 - 0.0011\,X_4$$

where

a_k – constant for specific mode

X_1 – access plus egress time (min)

X_2 – waiting time (min)

X_3 – travel time (min)

X_4 –cost of travel (tk)

Apply logit model to calculate the share of personal vehicle, bus and train out of 1000 trips having the characteristics shown in following table:

	a_k	X_1	X_2	X_3	X_4
Personal vehicle	-0.0055	5	0	30	250
Bus	-0.039	11	7	15	45
Train	-0.030	13	32	25	55

c) Shortly describe how the behavior of trip maker varies with trip purpose? 6

5. a) What are the factors affecting trip generation and trip attraction? 8

b) A land-use planner observed that in 5 zones of a city the number of fuel stations in consideration to population in 1000s was as follows: 14

Fuel stations	3	4	6	5	7
Population	20	14	8	11	15

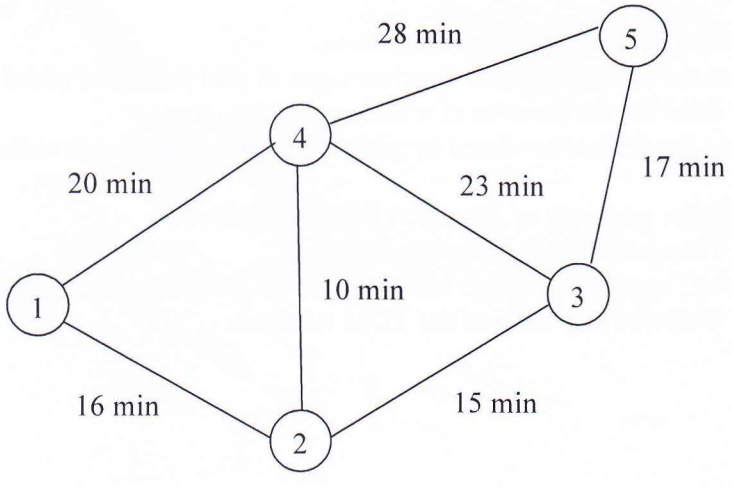
Set up a linear equation concerning fuel stations and population. Determine R^2.

c) Describe how transportation systems can be evaluated in terms of three basic attributes. 8

6. a) Name the factors influencing travel demand. 7

b) What are the basic assumptions of All or Nothing Assignment Model? 6

c) Find the traffic volume of all link of the following network using all or nothing assignment model. 17



Origin-Destination Trip Table between zones

From \ To	1	2	3	4	5
1	-	310	250	350	350
2	200	-	700	450	225
3	500	450	-	500	320
4	350	300	550	-	280
5	260	390	550	300	-

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2016
Program: Master in Civil Engineering

Course title: Irrigation and Drainage Engineering | Course code: CE 6608
Time: 3 hours | Full marks: 100

There are SEVEN questions. Answer <u>questions no. 01 and 07 (COMPULSORY)</u> and any THREE from the rest. (Assume any missing data.)

1. a) Write the benefits of irrigation and the harmful effects of excess irrigation. 5
   b) Describe check flooding method along with its advantages and disadvantages. 5
   c) Explain the necessity of cross-drainage works. 5
   d) What is leaching? Why drainage is important during irrigation? 5

2. a) Wheat has to be grown at a certain place, the useful climatological conditions of which are tabulated below. Determine the evapo-transpiration and consumptive irrigation requirement of wheat crop. Also determine the field irrigation requirement if the water application efficiency is 80%. Use Blaney-Criddle equation and a crop factor is 0.8. 10

Month	**Monthly temperature (^oC) averaged over the last 5 years**	**Monthly percent of day time hour of the year computed from the Sun-shine**	**Useful rainfall in cm averaged over the last 5 years**
November	18.0	7.20	1.7
December	15.0	7.15	1.42
January	13.5	7.30	3.01
February	14.5	7.10	2.75

   b) Determine the time required to irrigate a strip of land of 0.04 hectares in area from a tube-well with a discharge of 0.02 m^3/sec. The infiltration capacity of the soil may be taken as 5 cm/h and the average depth of flow on the field as 10 cm. Also determine the maximum area that can be irrigated from this tube well. 6
   c) What are the precautions you should take for using saline water for irrigation? 4

3. a) Derive the relationship between duty and delta for a given base period. 5
   b) Explain the following with neat sketch: i) Aqueduct ii) Super passage 5

c) A stream of 130 liters per second was diverted from a canal and 100 liters per second were delivered to the field. An area of 1.6 hectares was irrigated in 8 hours. The effective depth of root zone was 1.7 m. The runoff loss in the field was 420 m^3. The depth of water penetration varied linearly from 1.7 m at the head end of the field to 1.1 m at the tail end. Available moisture holding capacity of the soil is 20 cm per meter depth of soil. Irrigation was started at a moisture extraction level of 50% of the available moisture. Determine the following: 10

(a) water conveyance efficiency,
(b) water application efficiency,
(c) water storage efficiency and

4. a) Define the following: 6
   - Perennial irrigation
   - Flood irrigation
   - Lift irrigation

   b) After how many days will you supply water to soil in order to ensure sufficient irrigation of the given crop, if, 10
   - Available moisture= 18%
   - Unavailable moisture= 15%
   - Optimum moisture content = 16%
   - Dry density of soil = 1.3 gm/cc
   - Effective depth of root zone = 59 cm
   - Daily consumptive use of water for the given crop = 13 mm
   - Readily available moisture is 75% of the available moisture.

   c) What is spur? Explain different types of spur with neat sketch. 4

5. a) Explain the procedures for determining the required discharge capacity and number of spillways. 4

   c) The cultivable commanded area of a watercourse is 1200 hectares. Intensities of sugarcane and wheat crops are 20% and 40% respectively. The duties for the crops at the head of the watercourse are 730 hectares/cumec and 1800 hectares/cumec respectively. Find 10
   - The discharge required at the head of the watercourse
   - Determine the design discharge at the outlet, assuming a time factor equal to 0.8.

   d) Calculate the balancing depth for a channel section having a bed width equal to 18 m and side slopes of 1H:1V in cutting and 2H:1V in filling. The bank embankments are kept 3.0 m higher than the ground level (berm level) and crest width of banks is kept as 2.0 m. 6

6. a) Explain the following: i) Silt factor ii) Critical velocity ratio iii) Hydraulic mean depth iv) Regime channel 8

   b) Design an unlined irrigation channel on alluvial soil with the following data: 12
   Full supply discharge = 5.9 cumec
   Rugosity coefficient (n) = 0.0225
   C.V.R (m) = 1
   Bed slope = 1 in 5000
   Assume other reasonable data for the design. Two trials are compulsory.

7. a) What are the reasons for groundwater depletion in Bangladesh? How changing crop pattern could help Bangladesh in reducing internal water crisis? 10

b) How international water cooperation along Ganges, Brahmaputra and Meghna rivers basins could help Bangladesh to improve irrigation efficiency, reduce salinity and ensure sustainable ecosystem. 10

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2016
Program: MCE

Course Code: CE 6118 | **Time: 180 Minutes**
Course Title: Structural Vibration Control | **Full Marks: 20x10 = 200**

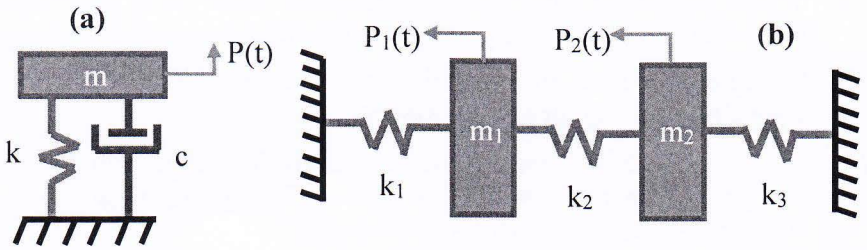
Answer any 10 of the following 14 Questions. *The figures are not drawn to scale.* Any missing data can be assumed reasonably.

[1] What do you understand by the term *structural vibration mitigation and control*? Write short notes on the following; (a) Passive Control, (b) Active Control, (c) Hybrid Control, (d) Optimum Control. **(20)**

[2] Which control approach do you think would be the best and why? What is a closed-loop? Explain different control approaches in closed-loop form (use appropriate sketches wherever necessary). **(20)**

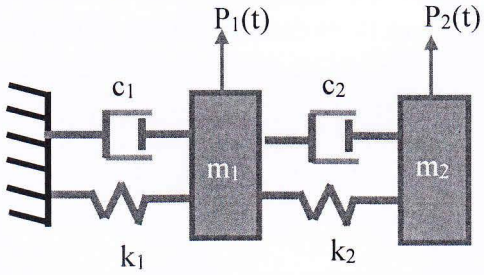
[3] What is Frequency Response Function (FRF)? How do you bring a system from time domain to frequency domain? Determine the FRF of the systems (a-b) depicted in Figure 1. **(20)**

Figure 1



[4] What is the purpose of FRF? Derive the frequency response function (FRF) of the system shown in Figure 2 and draw and explain the qualitative FRF plot of the system. Which mode of the structure is more important and why? **(20)**

Figure 2

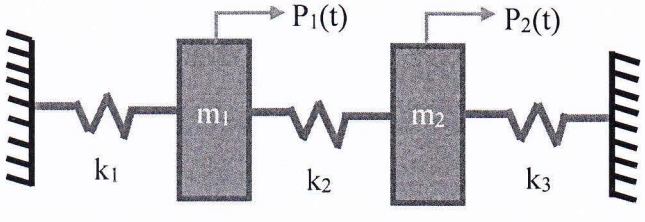


[5] What is a closed-control loop in vibration mitigation and control application? Show a hybrid closed-control loop and use the FRF that you have obtained in Problem [4] and explain what each control block will do during an extreme event e.g. earthquake. **(20)**

[6] Write down the equation of motion of a single-degree-of-freedom system for the damped and undamped cases and find the displacement equations for both cases by considering the mass 14 kg, stiffness 1000 N/m and is subjected to initial conditions $t = 0,\ \dot{x}_0 = 0.15\ \frac{m}{s},\ x_0 = 0.01$ m. **(20)**

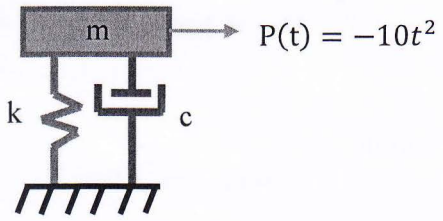
[7] What is the purpose of Eigenvalue analysis? Derive the equations of motion of the system shown in Figure 3. Also, determine the expression of Eigenfrequencies and Mode Shapes (draw qualitative mode shapes). Given, $m_1 = 2m,\ m_2 = m,\ k_1 = k_2 = k,\ k_3 = 2k$. **(20)**

Figure 3



[8] Determine the displacement and acceleration (expression only) of the SDOF system shown in Figure 4. Given, $m_1 = 80$ kg, $k = 8000 \frac{\text{N}}{\text{m}}$, consider 4% damping. **(20)**

Figure 4



[9] Determine the modal mass and stiffness matrices of the system shown in Figure 3. Also calculate the modal force vector of the system. Given, $P_1 = 100\sin(3.5t)$ N, $P_2 = 100\cos(3.5t)$ N, $m_1 = 11.12$ kg, $m_2 = 15.18$ kg, $k_1 = 8000 \frac{\text{N}}{\text{m}}$, $k_2 = 7000 \frac{\text{N}}{m}$, $k_3 = 7700 \frac{\text{N}}{m}$. **(20)**

[10] Which control approach is considered to be the smartest one among all available alternatives and why? What is Magnetorheological (MR) damper? Based on the mechanisms, is it feasible to adopt MR damper for vibration mitigation? If yes, then why? Explain with appropriate sketches if necessary. **(20)**

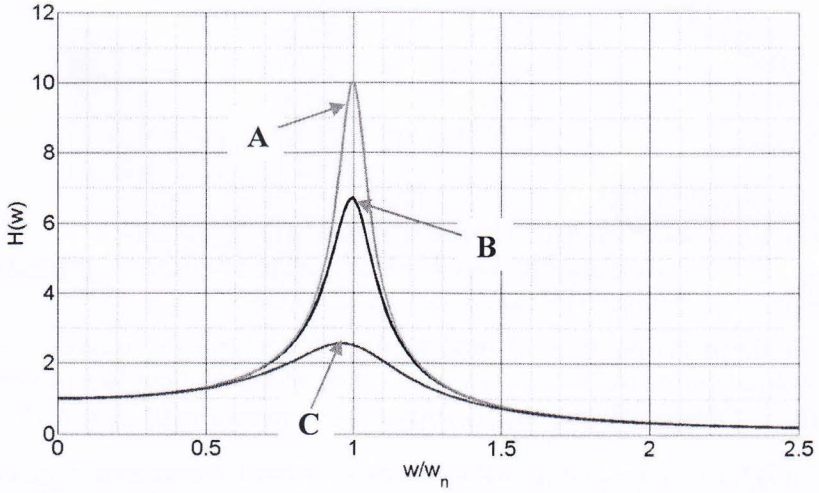
[11] Write a short note on tuned mass damper (TMD)? Which design criteria is the most important for a TMD? Summarize from historical references (must be in your words) that how much vibration mitigation of structures are possible with TMD. **(20)**

[12] What are the steps must be followed to design a TMD? Design a TMD that can provide 20% equivalent damping for a SDOF system. **(20)**

[13] Design a TMD for damped multi-degree-of-freedom system for a fundamental period of $T_1 = 2.5$ sec. Assume $m_1 = 200$ Kg, $m_2 = 150$ Kg and assume the damping is proportional to stiffness. Write your comments on the results. **(20)**

[14] What is bandwidth? Explain with a neat sketch. Find the bandwidth and damping ratios of the following systems A, B and C shown in Figure 5. Which system has the maximum damping? In reality, is it possible to have 100% damping via any vibration control system, if not, then why? **(20)**

Figure 5

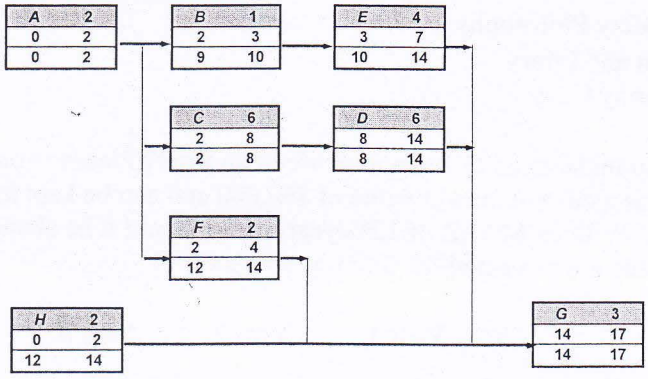


University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Spring 2016
Program: Masters in Engineering (Civil)

Course Title: Construction Planning and Management — Course Code: CE6005
Time: 3 Hour — Full Marks: 50

Answer Ques. No 2 and any 4

1(a) Why is construction safety in Bangladesh not up to the standard? 2
(b) Briefly describe the must required PPE in construction site. 2
(c) Describe 7 principles to prevent accident in construction site 2
(d) Find the free float and total float of all the activities (A to G) from the following diagram: 4



2(a) At what conditions shall we choose limited tendering method? 2
(b) A firm has estimated the following time for its project. The company has quoted 17 days for the project to be completed. What would be the probability of success that the project will be completed on time? 8

Activity	Predecessor	Optimistic Time (days)	Most likely Time (days)	Pessimistic Time (days)
a	-	3	4	5
b	-	3	5	7
c	-	5	6	7
d	a	2	3	4
e	b	6	8	10
f	b	5	3	7
g	c	5	6	7
h	d, e	5	3	7
i	f, g	1	2	3

Also determine the total duration of the project and critical patch of the project.

3(a) What do you understand by 'Time Value of Money'? 2
(b) What are major reasons that needed to be considered for 'Replacement'? 2
(c) What are the options to do with an existing asset? 1
(d) An asset purchased 2 years ago for $40,000 is harder to maintain than expected. It can be sold now for $12,000 or kept for a maximum of 2 more years, in which case its operating cost will be $20,000 each year, with a salvage value of $10,000 after 1 year or $9000 after two years. A suitable challenger will have an annual worth of $-24,000 per year. At an interest rate of 10% per year, should the defender be replaced now, one year from now, or two years from now? 5

... Continued

Course Title: Construction Planning and Management | Course Code: CE6005
Time: 3 Hour | Full Marks: 50

4(a)	What is meant by procurement?	1
(b)	Briefly describe the points to remember while purchasing/procurement.	2.5
(c)	What are the benefits of having reputed bidders' participation in procurement?	1.5
(d)	Describe briefly Open Tendering Method (OTM)	5

5. Write short notes on: 2x5 10

(a) MARR
(b) Ergonomic Hazard
(c) Basic Safety Philosophy
(d) Accident and Injury
(e) Opportunity Cost

6(a)	What do you understand by economic life of an asset? Please explain	2
(b)	A factory has a current market value of $60,000 and can be kept in service for 4 more years. With an MARR of 12%/year, when should it be abandoned? The following data are projected for future years:	8

	Year 1	Year 2	Year 3	Year 4
Net revenue	$50,000	$50,000	$15,000	$30,000
Market value	$35,000	$20,000	$15,000	$15,000
Repairing cost	-	$10,000	-	$30,000

Z Score Table- chart value corresponds to area below z score.

z	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.02	0.01	0.00
–3.4	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
–3.3	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0005
–3.2	0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007
–3.1	0.0007	0.0007	0.0008	0.0008	0.0008	0.0008	0.0009	0.0009	0.0009	0.0010
–3.0	0.0010	0.0010	0.0011	0.0011	0.0011	0.0012	0.0012	0.0013	0.0013	0.0013
–2.9	0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	0.0018	0.0018	0.0019
–2.8	0.0019	0.0020	0.0021	0.0021	0.0022	0.0023	0.0023	0.0024	0.0025	0.0026
–2.7	0.0026	0.0027	0.0028	0.0029	0.0030	0.0031	0.0032	0.0033	0.0034	0.0035
–2.6	0.0036	0.0037	0.0038	0.0039	0.0040	0.0041	0.0043	0.0044	0.0045	0.0047
–2.5	0.0048	0.0049	0.0051	0.0052	0.0054	0.0055	0.0057	0.0059	0.0060	0.0062
–2.4	0.0064	0.0066	0.0068	0.0069	0.0071	0.0073	0.0075	0.0078	0.0080	0.0082
–2.3	0.0084	0.0087	0.0089	0.0091	0.0094	0.0096	0.0099	0.0102	0.0104	0.0107
–2.2	0.0110	0.0113	0.0116	0.0119	0.0122	0.0125	0.0129	0.0132	0.0136	0.0139
–2.1	0.0143	0.0146	0.0150	0.0154	0.0158	0.0162	0.0166	0.0170	0.0174	0.0179
–2.0	0.0183	0.0188	0.0192	0.0197	0.0202	0.0207	0.0212	0.0217	0.0222	0.0228
–1.9	0.0233	0.0239	0.0244	0.0250	0.0256	0.0262	0.0268	0.0274	0.0281	0.0287
–1.8	0.0294	0.0301	0.0307	0.0314	0.0322	0.0329	0.0336	0.0344	0.0351	0.0359
–1.7	0.0367	0.0375	0.0384	0.0392	0.0401	0.0409	0.0418	0.0427	0.0436	0.0446
–1.6	0.0455	0.0465	0.0475	0.0485	0.0495	0.0505	0.0516	0.0526	0.0537	0.0548
–1.5	0.0559	0.0571	0.0582	0.0594	0.0606	0.0618	0.0630	0.0643	0.0655	0.0668
–1.4	0.0681	0.0694	0.0708	0.0721	0.0735	0.0749	0.0764	0.0778	0.0793	0.0808
–1.3	0.0823	0.0838	0.0853	0.0869	0.0885	0.0901	0.0918	0.0934	0.0951	0.0968
–1.2	0.0985	0.1003	0.1020	0.1038	0.1056	0.1075	0.1093	0.1112	0.1131	0.1151
–1.1	0.1170	0.1190	0.1210	0.1230	0.1251	0.1271	0.1292	0.1314	0.1335	0.1357
–1.0	0.1379	0.1401	0.1423	0.1446	0.1469	0.1492	0.1515	0.1539	0.1562	0.1587
–0.9	0.1611	0.1635	0.1660	0.1685	0.1711	0.1736	0.1762	0.1788	0.1814	0.1841
–0.8	0.1867	0.1894	0.1922	0.1949	0.1977	0.2005	0.2033	0.2061	0.2090	0.2119
–0.7	0.2148	0.2177	0.2206	0.2236	0.2266	0.2296	0.2327	0.2358	0.2389	0.2420
–0.6	0.2451	0.2483	0.2514	0.2546	0.2578	0.2611	0.2643	0.2676	0.2709	0.2743
–0.5	0.2776	0.2810	0.2843	0.2877	0.2912	0.2946	0.2981	0.3015	0.3050	0.3085
–0.4	0.3121	0.3156	0.3192	0.3228	0.3264	0.3300	0.3336	0.3372	0.3409	0.3446
–0.3	0.3483	0.3520	0.3557	0.3594	0.3632	0.3669	0.3707	0.3745	0.3783	0.3821
–0.2	0.3859	0.3897	0.3936	0.3974	0.4013	0.4052	0.4090	0.4129	0.4168	0.4207
–0.1	0.4247	0.4286	0.4325	0.4364	0.4404	0.4443	0.4483	0.4522	0.4562	0.4602
–0.0	0.4641	0.4681	0.4721	0.4761	0.4801	0.4840	0.4880	0.4920	0.4960	0.5000

z	**0.00**	**0.01**	**0.02**	**0.03**	**0.04**	**0.05**	**0.06**	**0.07**	**0.08**	**0.09**
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

Interest Rate	10.00%								10.00%
n	F/P	P/F	A/F	A/P	F/A	P/A	A/G	P/G	n
1	1.100	0.9091	1.0000	1.1000	1.000	0.909	0.000	0.000	1
2	1.210	0.8264	0.4762	0.5762	2.100	1.736	0.476	0.826	2
3	1.331	0.7513	0.3021	0.4021	3.310	2.487	0.937	2.329	3
4	1.464	0.6830	0.2155	0.3155	4.641	3.170	1.381	4.378	4
5	1.611	0.6209	0.1638	0.2638	6.105	3.791	1.810	6.862	5
6	1.772	0.5645	0.1296	0.2296	7.716	4.355	2.224	9.684	6
7	1.949	0.5132	0.1054	0.2054	9.487	4.868	2.622	12.763	7
8	2.144	0.4665	0.0874	0.1874	11.436	5.335	3.004	16.029	8
9	2.358	0.4241	0.0736	0.1736	13.579	5.759	3.372	19.421	9
10	2.594	0.3855	0.0627	0.1627	15.937	6.145	3.725	22.891	10
11	2.853	0.3505	0.0540	0.1540	18.531	6.495	4.064	26.396	11
12	3.138	0.3186	0.0468	0.1468	21.384	6.814	4.388	29.901	12
13	3.452	0.2897	0.0408	0.1408	24.523	7.103	4.699	33.377	13
14	3.797	0.2633	0.0357	0.1357	27.975	7.367	4.996	36.800	14
15	4.177	0.2394	0.0315	0.1315	31.772	7.606	5.279	40.152	15
16	4.595	0.2176	0.0278	0.1278	35.950	7.824	5.549	43.416	16
17	5.054	0.1978	0.0247	0.1247	40.545	8.022	5.807	46.582	17
18	5.560	0.1799	0.0219	0.1219	45.599	8.201	6.053	49.640	18
19	6.116	0.1635	0.0195	0.1195	51.159	8.365	6.286	52.583	19
20	6.727	0.1486	0.0175	0.1175	57.275	8.514	6.508	55.407	20
21	7.400	0.1351	0.0156	0.1156	64.002	8.649	6.719	58.110	21
22	8.140	0.1228	0.0140	0.1140	71.403	8.772	6.919	60.689	22
23	8.954	0.1117	0.0126	0.1126	79.543	8.883	7.108	63.146	23
24	9.850	0.1015	0.0113	0.1113	88.497	8.985	7.288	65.481	24
25	10.835	0.0923	0.0102	0.1102	98.347	9.077	7.458	67.696	25
26	11.918	0.0839	0.0092	0.1092	109.182	9.161	7.619	69.794	26
27	13.110	0.0763	0.0083	0.1083	121.100	9.237	7.770	71.777	27
28	14.421	0.0693	0.0075	0.1075	134.210	9.307	7.914	73.650	28
29	15.863	0.0630	0.0067	0.1067	148.631	9.370	8.049	75.415	29
30	17.449	0.0573	0.0061	0.1061	164.494	9.427	8.176	77.077	30
31	19.194	0.0521	0.0055	0.1055	181.943	9.479	8.296	78.640	31
32	21.114	0.0474	0.0050	0.1050	201.138	9.526	8.409	80.108	32
33	23.225	0.0431	0.0045	0.1045	222.252	9.569	8.515	81.486	33
34	25.548	0.0391	0.0041	0.1041	245.477	9.609	8.615	82.777	34
35	28.102	0.0356	0.0037	0.1037	271.024	9.644	8.709	83.987	35
36	30.913	0.0323	0.0033	0.1033	299.127	9.677	8.796	85.119	36
40	45.259	0.0221	0.0023	0.1023	442.593	9.779	9.096	88.953	40
48	97.017	0.0103	0.0010	0.1010	960.17	9.897	9.500	94.02	48
50	117.391	0.0085	0.0009	0.1009	1163.91	9.915	9.570	94.89	50
52	142.043	0.0070	0.0007	0.1007	1410.43	9.930	9.631	95.64	52
60	304.482	0.0033	0.0003	0.1003	3034.82	9.967	9.802	97.70	60
70	789.75	0.0013	0.0001	0.1001	7887.5	9.987	9.911	98.99	70
72	955.59	0.0010	0.0001	0.1001	9545.9	9.990	9.925	99.14	72
80	2048.40	0.0005	0.0000	0.1000	20474.0	9.995	9.961	99.56	80
84	2999.1	0.0003	0.0000	0.1000	29981.	9.997	9.972	99.69	84
90	5313.0	0.0002	0.0000	0.1000	53120.	9.998	9.983	99.81	90
96	9412.3	0.0001	0.0000	0.1000	94113.	9.999	9.990	99.89	96
100	13780.6	0.0001	0.0000	0.1000	137796.	9.999	9.993	99.92	100
inf.	inf.	0.0000	0.0000	0.1000	inf.	10.0000	10.000	100.00	inf.

Interest Rate	12.00%								12.00%
n	F/P	P/F	A/F	A/P	F/A	P/A	A/G	P/G	n
1	1.120	0.8929	1.0000	1.1200	1.000	0.893	0.000	0.000	1
2	1.254	0.7972	0.4717	0.5917	2.120	1.690	0.472	0.797	2
3	1.405	0.7118	0.2963	0.4163	3.374	2.402	0.925	2.221	3
4	1.574	0.6355	0.2092	0.3292	4.779	3.037	1.359	4.127	4
5	1.762	0.5674	0.1574	0.2774	6.353	3.605	1.775	6.397	5
6	1.974	0.5066	0.1232	0.2432	8.115	4.111	2.172	8.930	6
7	2.211	0.4523	0.0991	0.2191	10.089	4.564	2.551	11.644	7
8	2.476	0.4039	0.0813	0.2013	12.300	4.968	2.913	14.471	8
9	2.773	0.3606	0.0677	0.1877	14.776	5.328	3.257	17.356	9
10	3.106	0.3220	0.0570	0.1770	17.549	5.650	3.585	20.254	10
11	3.479	0.2875	0.0484	0.1684	20.655	5.938	3.895	23.129	11
12	3.896	0.2567	0.0414	0.1614	24.133	6.194	4.190	25.952	12
13	4.363	0.2292	0.0357	0.1557	28.029	6.424	4.468	28.702	13
14	4.887	0.2046	0.0309	0.1509	32.393	6.628	4.732	31.362	14
15	5.474	0.1827	0.0268	0.1468	37.280	6.811	4.980	33.920	15
16	6.130	0.1631	0.0234	0.1434	42.753	6.974	5.215	36.367	16
17	6.866	0.1456	0.0205	0.1405	48.884	7.120	5.435	38.697	17
18	7.690	0.1300	0.0179	0.1379	55.750	7.250	5.643	40.908	18
19	8.613	0.1161	0.0158	0.1358	63.440	7.366	5.838	42.998	19
20	9.646	0.1037	0.0139	0.1339	72.052	7.469	6.020	44.968	20
21	10.804	0.0926	0.0122	0.1322	81.699	7.562	6.191	46.819	21
22	12.100	0.0826	0.0108	0.1308	92.503	7.645	6.351	48.554	22
23	13.552	0.0738	0.0096	0.1296	104.603	7.718	6.501	50.178	23
24	15.179	0.0659	0.0085	0.1285	118.155	7.784	6.641	51.693	24
25	17.000	0.0588	0.0075	0.1275	133.334	7.843	6.771	53.105	25
26	19.040	0.0525	0.0067	0.1267	150.334	7.896	6.892	54.418	26
27	21.325	0.0469	0.0059	0.1259	169.374	7.943	7.005	55.637	27
28	23.884	0.0419	0.0052	0.1252	190.699	7.984	7.110	56.767	28
29	26.750	0.0374	0.0047	0.1247	214.583	8.022	7.207	57.814	29
30	29.960	0.0334	0.0041	0.1241	241.333	8.055	7.297	58.782	30
31	33.555	0.0298	0.0037	0.1237	271.293	8.085	7.381	59.676	31
32	37.582	0.0266	0.0033	0.1233	304.848	8.112	7.459	60.501	32
33	42.092	0.0238	0.0029	0.1229	342.429	8.135	7.530	61.261	33
34	47.143	0.0212	0.0026	0.1226	384.521	8.157	7.596	61.961	34
35	52.800	0.0189	0.0023	0.1223	431.663	8.176	7.658	62.605	35
36	59.136	0.0169	0.0021	0.1221	484.463	8.192	7.714	63.197	36
40	93.051	0.0107	0.0013	0.1213	767.091	8.244	7.899	65.116	40
48	230.391	0.0043	0.0005	0.1205	1911.59	8.297	8.124	67.41	48
50	289.002	0.0035	0.0004	0.1204	2400.02	8.304	8.160	67.76	50
52	362.524	0.0028	0.0003	0.1203	3012.70	8.310	8.189	68.06	52
60	897.597	0.0011	0.0001	0.1201	7471.64	8.324	8.266	68.81	60
70	2787.80	0.0004	0.0000	0.1200	23223.3	8.330	8.308	69.21	70
72	3497.02	0.0003	0.0000	0.1200	29133.5	8.331	8.313	69.25	72
80	8658.48	0.0001	0.0000	0.1200	72145.7	8.332	8.324	69.36	80
84	13624.3	0.0001	0.0000	0.1200	113527.	8.333	8.327	69.39	84
90	26891.9	0.0000	0.0000	0.1200	224091.	8.333	8.330	69.41	90
96	53079.9	0.0000	0.0000	0.1200	442324.	8.333	8.332	69.43	96
100	83522.3	0.0000	0.0000	0.1200	696011.	8.333	8.332	69.43	100
inf.	inf.	0.0000	0.0000	0.1200	inf.	8.3333	8.333	69.44	inf.