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INS

Answer Sheet: Online Examination

23/12/2021

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Name of the student:

Devansh Shah

Signature of the student:

Q. No.: 1

(A)

- 1) a
- 2) a
- 3) c
- 4) b
- 5) b
- 6) a
- 7) b
- 8) b
- 9) d
- 10) a

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Devarsh Shah

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(B)

1) The IP Security is an Internet Engineering Task force Standard suite of protocols between 2 communication points across the IP network that provide data authentication, integrity and confidentiality. The applications are:-

- i) To encrypt application layer data
- ii) To provide security for routers sending routing data across the public internet.
- iii) To authenticate that data originates from a known sender.
- iv) To protect network data by setting up circuits using IPsec tunneling.

3) DACMAC

- DAC stands for Discretionary Access Control
- The owner can determine the access and privileges and can restrict the resources based on identity of the users.
- complete trust in users and user provided access based on their identity and not using levels.
- vulnerable to Trojan horses
- MAC stands for Mandatory Access Control
- The system only determines the access and the resources will be restricted based on clearance
- trust only in administrators and users are restricted based on their power and level of hierarchy.
- prevents virus flow from a higher level to a lower level.

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2)

Linearization attacks are attack that take advantage of coding flaws such as using the fine an authentication program ran for to check and match number of correct characters and brute forcing the way ahead.

eg) password = "Devansh"

user_input = input()

flag = True

for i in range(len(password)):

if password[i] == user_input[i]:

 continue

else:

 flag = False

 break

if flag == False:

 print("auth failed")

else:

 print("authenticated")

Hence we can see that the code checks the password and input string letter by letter. ∴ code will terminate quicker if the characters don't match making it unusable to keep guessing the character in our password, as more matches would mean more execution time.

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(B)

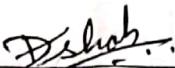
- 4) Shannon's characteristics of good ciphers :-
- The amount of secrecy needed should determine the amount of labor appropriate for encryption and decryption.
 - The set of keys and enciphering algorithm should be free from complexity.
 - The implementation of the process should be as simple as possible.
 - Errors in ciphering should not propagate and cause corruptions of further information in the message.
 - The size of the enciphered text should be no larger than the text of the original message.
- 5) A PKI consists of CA (certificate authority) that stores, issues and signs the digital certificates and RA (registration authority) which verifies the identity of entities requesting their digital certificates to be stored at the CA.
- The primary role of CA is to digitally sign and publish the public key bound to a given user. A registration authority is an authority in a network that verifies user requests for digital certificate and tells the CA to issue it.

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2) The Biba integrity policy model is designed to express some access control rules in order to ensure data integrity. The data and subjects in this are ordered by level of integrity into groups or arrangements. It was created to be better than Bell-LaPadula model, to address integrity.

i) Simple integrity property:

- a person of given integrity level isn't permitted to read an object of lower integrity.

ii) Star integrity property:

- a person of given integrity level isn't permitted to write data to higher level of integrity.

iii) Invocation property:

- person from below cannot request higher access. Can only request at equal or lower level.

Biba Integrity Model

- prevents information flow from low security levels to high security levels.
- addresses data integrity
- based off of Bell-La-Padula and improved upon

Bell-La-Padula

- prevents flow of information from high security to low security levels
- addresses data confidentiality
- This was the first model.

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Devansh Shah

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Q. No.: 2

3)

a) Confidentiality

- This refers to an organization's effort to keep their data private or secret.
- It's about controlling access to data to prevent unauthorized disclosure.
- Only the sender and the intended receiver should be able to understand the contents of the transmitted message.
- Confidentiality can be ensured by passwords, encryption, authentication and defense against penetration attacks.

b) Integrity

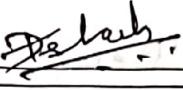
- In everyday usage, integrity refers to the quality of something being whole or complete.
- Here it is all about ensuring that data has not been tampered with and hence can be trusted.
- Integrity assures information and programs are complete and accurate and are ~~changed~~ changed only in a specific and authorized manner.
- Integrity can be ensured by checksums, version control software and frequent backups.

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c) Availability

- This means that the data is available or accessible in a timely and reliable manner to authorized entities whenever needed.
- It ensures that authorized users have timely, reliable access to resources.
- Availability can be ensured by matching network and computing resources, implementing a good backup policy for disaster recovery.

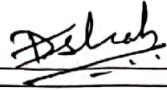
All of the above 3 are part of CIA triad. A concrete example where integrity of the data is more important than confidentiality is a website that provides maps to the users, in this case confidentiality is not the main entity since a region's map is open for everyone but the integrity is important for everyone to reach their destination accurately.

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Q. No.: 3

1) The step required to create a digital certificate involves three parties i.e. the end user, registration authority and the certificate authority.

- The end user requests for the digital certificate and the request goes to the RA which then assists the CA to create the digital certificate.
- RA acts as an intermediate between the end user and the CA and also assists the day to day task of CA. It provides services such as accepting and verifying the details of new user's registration, user key generation, backups and recovery of key and certificate cancellations.

Steps of digital certificate creation are:-

- Key generation is done by either user or RA. The public key which is generated is sent to RA and the private key is kept by the user.
- In the next step, RA registers the user.
- Next step is verification which is done by RA in which the user's credentials are being verified by RA. It also checks that the user who sent the public key has

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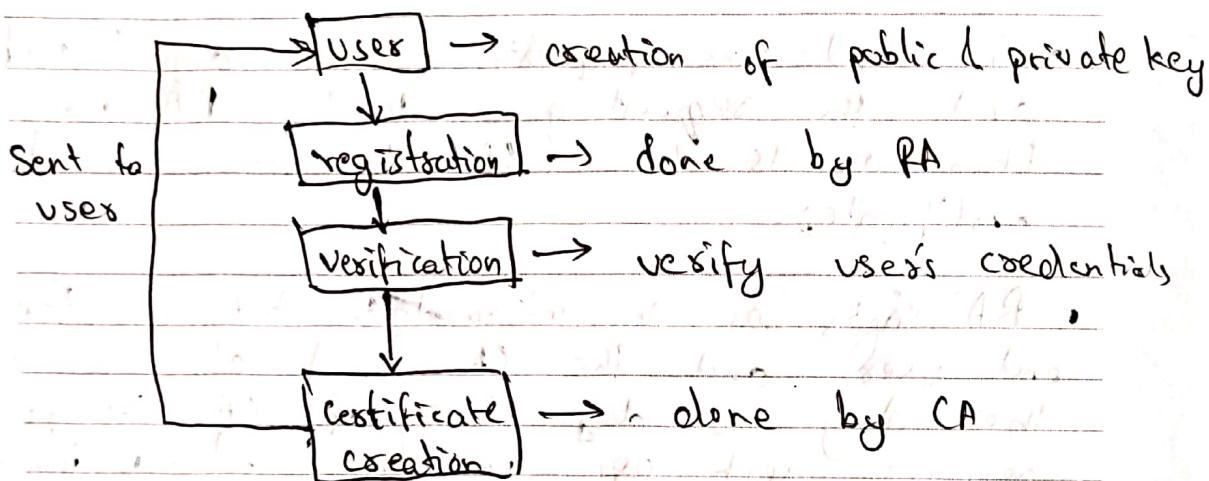
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- iv) the corresponding private key or not,
- In this step, the details are sent to CA by RA who creates the digital certificate and gives it to the user and also keeps a copy to itself.



The contents of digital certificate are:-

- i) Name of certificate holder
- ii) Serial number which is used to uniquely identify a certificate, the individual or entity certified by the certificate.
- iii) Expiration date
- iv) Copy of certificate holder's public key.
- v) Digital signature of certificate issuing authority.

∴ we can say that digital certificates are files that ensure holder's identity and provides security and authenticity to the certificate holder.

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Q. No.: 4

Poly alphabetic cipher is any cipher that is based on substitution using multiple alphabets. Different poly alphabetic cipher ciphers are:-

i) Playfair cipher

ii) Roto

iii) One-time pad

iv) Enigma cipher

v) Vigenere cipher

vi) Autokey cipher

vii) Posta cipher

viii) Hill cipher

Monoalphabetic

- Each symbol in plain text is mapped to a fixed symbol in cipher text

- The relationship between a character in plain text and the characters in cipher text is one-to-one mapping from plaintext to cipher text across the entire text.

Poly alphabetic

- uses multiple substitution alphabet.

- The relationship between a character in the plain text is one to many to that of cipher text i.e. plain text is different from cipher text even for same alphabets which are repeated

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iii) A stream cipher is a monoalphabetic cipher if the value of key does not depend on the position of the plain text character in the plain text

A stream cipher is polyalphabetic cipher if the value of the key does depend on the position of the plain text character in the plain text stream.

iv) example: addition, multiplication, affine and monoalphabetic substitution cipher

Autokey, playfair, vignere, Hill, One time pad, rot13 and enigma

v) Monoalphabetic ciphers are not that strong as compared to polyalphabetic ciphers.

- They are much more stronger.

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Message = HIDE THE GOLD IN THE TREE STUMP
 Key = PLAYFAIR EXAMPLE

Step 1: Creation and population of key square matrix

P	L	A	Y	F
I	R	E	X	M
B	C	D	G	H
K	N	O	Q	S
T	U	V	W	Z

Step 2: Creating paragraph plaintext

Plaintext / Message = HIDE THE GOLD IN
 THE TREE STUMP

H I D E T H E G O L D N I T H E T R E X E S
 T U M P

Step 3: encryption rules :-

- If both letters are in same column, take the letter below each
- Same row, take letter to the right
- neither of above then form a rectangle with the two letters and take letters on horizontal opposite corner

∴ Encrypted = BMODZBXDNAFKEVUDHUVJXM
 Message MDUVIF

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eg) for HI we use rule 3 and form a rectangle and get BM as encrypted text whereas for DE we use rule 1 as they lie in some column we take O for D and P for E and so on.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	12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