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**FINAL EXAMINATION / PEPERIKSAAN AKHIR  
SEMESTER I – SESSION 2020 / 2021  
PROGRAM KERJASAMA**

COURSE CODE : DDWC 1673  
*KOD KURSUS*

COURSE NAME : DATA COMMUNICATION AND NETWORKING  
*NAMA KURSUS KOMUNIKASI DATA DAN RANGKAIAN*

YEAR / PROGRAMME : 1 DDWC/DDWZ  
*TAHUN / PROGRAM*

DURATION : 3 HOURS (INCLUDING SUBMISSION HOUR)  
*TEMPOH 3 JAM (TERMASUK MASA PENGHANTARAN)*

DATE : NOVEMBER 2020  
*TARIKH*

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**INSTRUCTION / ARAHAN:**

1. Answer **ALL** questions and write your answers on the answer sheet.  
*Jawab **SEMUA** soalan dan tulis jawapan anda pada kertas jawapan.*
  2. Write your name, matric no., identity card no., course code, course name, section no. and lecturer's name on the first page (in the upper left corner) and every page thereafter on the answer sheet.  
*Tulis nama anda, no. matrik, no. kad pengenalan, kod kursus, nama kursus, no. seksyen dan nama pensyarah pada muka surat pertama (penjuru kiri atas) kertas jawapan dan pada setiap muka surat jawapan.*
  3. Each answer sheet must have a page number written at the bottom right corner.  
*Setiap helai kertas jawapan mesti ditulis nombor muka surat pada bahagian bawah penjuru kanan.*
  4. Answers should be handwritten, neat and clear.  
*Jawapan hendaklah ditulis tangan, kemas dan jelas menggunakan huruf cerai.*
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**WARNING / AMARAN**

Students caught copying / cheating during the examination will be liable for disciplinary actions and the faculty may recommend the student to be expelled from sitting for exam.  
*Pelajar yang ditangkap meniru / menipu semasa peperiksaan akan dikenakan tindakan disiplin dan pihak fakulti boleh mengesyorkan pelajar diusir dari menduduki peperiksaan.*

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This examination paper consists of 7 pages including the cover.  
*Kertas soalan ini mengandungi 7 muka surat termasuk kulit hadapan.*

**ONLINE EXAMINATION RULES AND REGULATIONS**  
**PERATURAN PEPERIKSAAN SECARA DALAM TALIAN**

1. Student must carefully listen and follow instructions provided by invigilator.  
*Pelajar mesti mendengar dan mengikuti arahan yang diberikan oleh pengawas peperiksaan dengan teliti.*
2. Student is allowed to start examination only after confirmation of invigilator if all needed conditions are implemented.  
*Pelajar dibenarkan memulakan peperiksaan hanya setelah pengesahan pengawas peperiksaan sekiranya semua syarat yang diperlukan telah dilaksanakan.*
3. During all examination session student has to ensure, that he is alone in the room.  
*Semasa semua sesi peperiksaan pelajar harus memastikan bahawa dia bersendirian di dalam bilik.*
4. During all examination session student is not allowed to use any other devices, applications except other sites permitted by course lecturer.  
*Sepanjang sesi peperiksaan pelajar tidak dibenarkan menggunakan peranti dan aplikasi lain kecuali yang dibenarkan oleh pensyarah kursus.*
5. After completing the exam student must inform invigilator via the set communication platform (eg. WhatsApp etc.) about completion of exam and after invigilator's confirmation leave examination session.  
*Selepas peperiksaan selesai, pelajar mesti memaklumkan kepada pengawas peperiksaan melalui platform komunikasi yang ditetapkan (contoh: Whatsapp dan lain-lain) mengenai peperiksaan yang telah selesai dan meninggalkan sesi peperiksaan selepas mendapat pengesahan daripada pengawas peperiksaan.*
6. Any technical issues in submitting answers online have to be informed to respective lecturer within the given 30 minutes. Request for re-examination or appeal will not be entertain if complains are not made by students to their lecturers within the given 30 minutes.  
*Sebarang masalah teknikal dalam menghantar jawapan secara dalam talian perlu dimaklumkan kepada pensyarah masing-masing dalam masa 30 minit yang diberikan. Permintaan untuk pemeriksaan semula atau rayuan tidak akan dilayan sekiranya aduan tidak dibuat oleh pelajar kepada pensyarah mereka dalam masa 30 minit yang diberikan.*
7. During online examination, the integrity and honesty of the student is also tested. At any circumstances student is not allowed to cheat during examination session. If any kind of cheating behaviour is observed, UTM have a right to follow related terms and provisions stated in the respective Academic Regulations and apply needed measures.  
*Semasa peperiksaan dalam talian, integriti dan kejujuran pelajar juga diuji. Walau apa pun keadaan pelajar tidak dibenarkan menipu semasa sesi peperiksaan. Sekiranya terdapat sebarang salah laku, UTM berhak untuk mengikuti terma yang dinyatakan dalam Peraturan Akademik.*

**ANSWER ALL QUESTIONS [100 MARKS]**

**JAWAB SEMUA SOALAN [100 MARKAH]**

1. a) Briefly explain the criteria of ATM technology. **[5M]**  
*Terangkan secara ringkas kriteria teknologi ATM.*
- b) State **three (3)** types of services available in the ATM? Describe briefly one of them. **[6M]**  
*Nyatakan **tiga (3)** jenis perkhidmatan yang ada dalam ATM? Terangkan secara ringkas satu daripadanya.*
- c) Explain the advantages of IPv6 over IPv4 in the network layer. **[5M]**  
*Terangkan kelebihan IPv6 berbanding IPv4 dalam lapisan rangkaian.*
2. a) What are **five (5)** characteristics of good design VPN? **[5M]**  
*Apakah **lima (5)** ciri rekabentuk VPN yang baik?*
- b) Explain how the VPN works. Use examples of services at your campus. **[6M]**  
*Terangkan bagaimana perkhidmatan VPN berfungsi. Gunakan contoh perkhidmatan di kampus anda.*
3. Match the following to one or more layers of the OSI model:  
*Padankan berikut kepada satu atau lebih lapisan model OSI:*
- a. Direct communication with the user's application program. **[2M]**  
*Komunikasi terus dengan aplikasi aturcara pengguna.*
- b. Error correction and retransmission. **[2M]**  
*Pembetulan ralat dan penghantaran semula.*
- c. Mechanical, electrical, and functional interface. **[2M]**  
*Mekanikal elektrik dan fungsi-fungsi antaramuka.*
- d. Responsibility for information between adjacent nodes. **[2M]**  
*Bertanggungjawab bagi maklumat diantara nod yang bersebelahan.*

- e. Reassembly of data packets. [2M]  
*Menyusun semula paket-paket data.*
4. There are four types of redundancy checks used in data communications: vertical redundancy check (VRC), longitudinal redundancy check (LRC), cyclic redundancy check (CRC), and checksum.  
*Terdapat empat jenis semak lelebih digunakan dalam komunikasi data: semak lelebih menegak (VRC), semak lelebih membujur (LRC), semak lelebih kitaran (CRC), dan semak-jumlah.*
- a. Write the binary data with the VRC for the word: **BOOK** (see Appendix A – code your character with ASCII) [3M]  
*Tuliskan data binari dengan VRC bagi perkataan: **BOOK** (lihat Lampiran A- kodkan aksara anda dengan ASCII)*
- b. Generate the checksum of 8 bits for the following block of data: [6M]  
*Jana semak-jumlah bagi blok data 8 bit berikut:*  
**1 0 1 0 1 0 0 1 1 0 1 0 1 0 1 1 1 1 0 0 0 0**
5. The number of needed usable host is **45** and the network address is **198.125.50.0**. Answer all questions below.  
*Bilangan hos yang boleh digunakan adalah **45** dan alamat rangkaian adalah **198.125.50.0**.  
Jawab semua soalan di bawah.*
- a) What is the address class [2M]  
*Apakah alamat kelas*
- b) What is the default subnet mask [2M]  
*Apakah topeng subnet lalai*
- c) What is the custom subnet mask [2M]  
*Apakah topeng subnet custom*
- d) Calculate total number of subnets [2M]  
*Kira jumlah bilangan subnet*
- e) Calculate total number of host addresses [2M]  
*Kira jumlah bilangan alamat hos*
- f) Calculate number of usable addresses [2M]  
*Kira bilangan alamat yang boleh digunakan*
- g) Calculate number of bits borrowed [2M]  
*Kira bilangan bit yang dipinjam*

- h) Calculate the second subnet range. [2M]  
*Kira julat subnet kedua*
- i) Calculate the subnet number for the second subnet. [2M]  
*Kira bilangan subnet bagi subnet kedua.*
- j) Calculate the assignable addresses for the third subnet. [2M]  
*Kira alamat yang diumpukan bagi subnet ke tiga.*

6. Answer the following question based on error detection and correction.

*Jawab soalan berikut berdasarkan kaedah pengesanan dan pembetulan ralat.*

- a. Construct Hamming code for the bit sequence **11110010001** [8M]  
*Hasilkan kod Hamming bagi jujukan bit 11110010001*

- b. Given a 10 bit sequence **100100** and a divisor of **1101**, find the CRC. Show your answer at sender and receiver. [8M]

*Diberi jujukan 10 bit 100100 dan pembahagi 1101, cari CRC. Tunjukkan jawapan anda pada penghantar dan penerima.*

7. Assume data stream is 1010101111. Encode this data stream using the following encoding schemes.

*Andaikan aliran data adalah 1010101111. Kodkan aliran data ini menggunakan skema pengkodan di bawah.*

- a. Polar NRZ-I [3M]
- b. Manchester [3M]
- c. AMI [3M]

8. Refer Figure 1 for the following questions:

*Rujuk Rajah 1 bagi soalan-soalan berikut:*

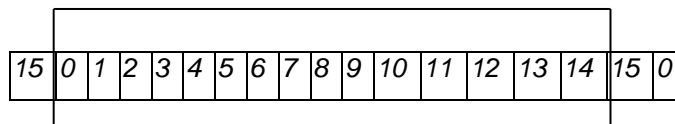


Figure 1/Rajah 1

- a. Show the window after the sender has sent packets 0 to 11 and has received ACK 8. [3M]

*Tunjukkan tettingkap selepas penghantar menghantar paket 0 hingga 11 dan menerima ACK 8.*

- b. The sender has sent packet 0 to 14, no acknowledgement has been received, and timeout has expired. Show the sender windows. **[3M]**

*Penghantar menghantar paket 0 hingga 14, tiada pemberitahuan diterima dan masa telah tamat. Tunjukkan tettingkap penghantar.*

- c. The receiver has sent ACK 6 and ACK 9, but ACK 6 is lost. Show the sender window

**[3M]**

*Penerima menghantar ACK 6 dan ACK 9, tetapi ACK 6 telah hilang. Tunjukkan tettingkap penghantar.*

Appendix A/ Lampiran A

					0	0	0	0	1	1	1	1	1
					0	1	2	3	4	5	6	7	
Bits	b <sub>4</sub>	b <sub>3</sub>	b <sub>2</sub>	b <sub>1</sub>	Counter								
0 0 0 0	0	0	0	0	0	NUL	DLE	SP	0	@	P	·	
0 0 0 1	0	0	0	1	1	SOH	DC1	!	1	A	Q	a	
0 0 1 0	0	0	1	0	2	STX	DC2	"	2	B	R	b	
0 0 1 1	0	0	1	1	3	ETX	DC3	#	3	C	S	c	
0 1 0 0	0	1	0	0	4	EOT	DC4	\$	4	D	T	d	
0 1 0 1	0	1	0	1	5	ENQ	NAK	%	5	E	U	e	
0 1 1 0	0	1	1	0	6	ACK	SYN	&	6	F	V	f	
0 1 1 1	0	1	1	1	7	BEL	ETB	'	7	G	W	g	
1 0 0 0	1	0	0	0	8	BS	CAN	(	8	H	X	h	
1 0 0 1	1	0	0	1	9	HT	EM	)	9	I	Y	i	
1 0 1 0	1	0	1	0	10	LF	SUB	*	:	J	Z	j	
1 0 1 1	1	0	1	1	11	VT	ESC	+	;	K	[	k	
1 1 0 0	1	1	0	0	12	FF	FC	-	<	L	\	l	
1 1 0 1	1	1	0	1	13	CR	GS	=	=	M	]	m	
1 1 1 0	1	1	1	0	14	SO	RS	>	>	N	^	n	
1 1 1 1	1	1	1	1	15	SI	US	/	?	O	_	o	
												DEL	

END OF QUESTIONS/SOALAN TAMAT