UNIVERSITI TUN HUSSEIN ONN MALAYSIA

PEPERIKSAAN AKHIR
SEMESTER I
SESI 2011/2012

NAMA KURSUS	:	PENJADUALAN DAN PERANCANGAN BINAAN
KOD KURSUS	:	BPF 4283
PROGRAM	:	4 BPD
TARIKH PEPERIKSAAN	:	JANUARI 2012
JANGKA MASA	:	3 JAM
ARAHAN	:	BAHAGIAN A JAWAB **SEMUA** SOALAN. BAHAGIAN B JAWAB DUA (2) SOALAN SAHAJA DARIPADA TIGA (3) SOALAN

KERTAS SOALAN INI MENGANDUNGI **ENAM BELAS (16)** MUKA SURAT

BAHAGIAN A (60 markah)

S1   Pengurusan projek pembinan memerlukan beberapa teknik dan kaedah tertentu bagi tujuan memastikan kehendak klien dapat dicapai dari segi masa, kos dan kualiti.

(a)   Terangkan secara ringkas maksud **TIGA (3)** pengukuran prestasi projek tersenarai di bawah yang digunakan bagi tujuan pengawalan projek pembinaan.

(i)   *Budgeted Cost of Work Scheduled (BCWS)*
(ii)   *Budgeted Cost of Work Performed (BCWP)*
(iii)   *Actual Cost of Work Performed (ACWP)*

(6 markah)

(b)   Nyatakan **DUA (2)** kelebihan dan **DUA (2)** kekurangan CARTA BAR sebagai satu alat untuk membantu dalam penjadualan dan pengurusan projek.

(4 markah)

(c)   Dengan menggunakan kaedah *crashing* menyelesaikan masalah menyiapkan projek berikut mengikut tempoh tertentu, sila jawab **S1 (c) (i)-(iii)** berasaskan **Jadual S1** di bawah:

Jadual S1: Informasi projek

Aktiviti	Di dahului	Tempoh Biasa (minggu)	Kos Biasa (RM)	Tempoh Crash (minggu)	Kos Crash (RM)
A	-	6	200	2	500
B	A	5	300	3	600
C	A	4	100	2	250
D	A	8	400	4	800
E	C	6	700	4	1,000
F	B,E	2	200	1	300
G	C	5	300	4	400
H	D	4	500	3	900
I	H	3	400	1	150
J	F,G	3	200	2	60
K	J, I	2	300	1	80

(i)   Bina rajah rangkaian projek.

(6 markah)

(ii)   Tentukan aliran genting (critical path) dalam rajah rangkaian projek di **S1 (c) (i)**.

(2 markah)

(iii)   Sediakan rajah rangkaian serta jadual informasi projek bagi tujuan *crash* projek supaya projek dapat disiapkan dalam tempoh 21 minggu.

(10 markah)

(iv)   Hitungkan kos baru bagi projek berkenaan setelah di *crash* supaya dapat disiapkan dalam 21 minggu.

(2 markah)

Q1   Construction project management requires a few techniques and methods in order to ensure that the client's requirements can be achieved in terms of time, cost and quality.

(a)   Explain briefly **THREE (3)** project performance measures listed below that are used to control construction projects.

(i)   Budgeted Cost of Work Scheduled (BCWS)
(ii)   Budgeted Cost of Work Performed (BCWP)
(iii)   Actual Cost of Work Performed (ACWP)

(6 marks)

(b)   State **TWO (2)** advantages and **TWO (2)** disadvantages of BAR CHARTS as a tool to assist in planning and management of projects.

(4 marks)

(c)   Use the crashing method in order to resolve the problem of completing the project according to the required period of 21 weeks; answers to question **Q1 (c) (i)-(iii)** are to be based on **Table Q1**:

Table Q1 : Project Information

Activity	Preceded by	Normal Time (wks)	Normal Cost (RM)	Crash Time (wks)	Crash Cost (RM)
A	-	6	200	2	500
B	A	5	300	3	600
C	A	4	100	2	250
D	A	8	400	4	800
E	C	6	700	4	1,000
F	B,E	2	200	1	300
G	C	5	300	4	400
H	D	4	500	3	900
I	H	3	400	1	150
J	F,G	3	200	2	60
K	J, I	2	300	1	80

(i)   Draw a precedence network diagram using the critical path method (CPM) for the project.

(6 marks)

(ii)   Identify the critical path of the CPM diagram sketched in **Q1 (c) (i)**.

(2 marks)

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(iii) *Draw a CPM diagram, as well as provide a project information table based on the action of crashing the project in order to be completed within a period of 21 weeks.*

(10 marks)

(iv) *Calculate the kos of the project after it has been crashed to 21 weeks.*

(2 marks)

S2 Maklumat tentang aktiviti bagi menyelenggara projek tertentu tersenarai di **Jadual S2**.

(a) Lukiskan gambarajah kaedah laluan genting (CPM) bagi projek ini.

(6 markah)

(b) Sila gunakan format **Jadual I** yang disertakan dalam **Lampiran I** bagi menjawab soalan berikut:

(i) Hitungkan jangka masa tamat projek (masa yang paling singkat projek boleh disiapkan).

(2 markah)

(ii) Catatkan masa awal mula (ES), awal tamat (EF), lewat mula (LS), lewat tamat (LF), jumlah apungan keseluruhan (TF) bagi semua aktiviti serta tandakan laluan genting dalam bentuk jadual.

(6 markah)

Jadual S2: Data Projek

Aktiviti	Di dahului	Di ikuti	Jangka masa (minggu)	Kos aktiviti (RM)
A	-	B, C, D	2	4 000
B	A	E	2	5 000
C	A	F	5	1 000
D	A	G	3	3 000
E	B	H	4	2 000
F	C	H	2	1 200
G	D	I, J	5	2 000
H	E, F	I	7	7 700
I	H, G	K	3	9 000
J	G	K	6	3 000
K	I, J	L	3	6 000
L	K	-	4	4 800

(c) Andaikan aktiviti **E** dilewatkan dua minggu, aktiviti **H** dilewatkan satu minggu dan aktiviti **K** dilewatkan tiga minggu.

(i) Lukis gambarajah kaedah laluan genting (CPM) bagi penjadualan projek yang terkini.

(6 markah)

(ii) Nyatakan tempoh penamatan projek yang terbaru.

(2 markah)

(iii) Catatkan masa awal mula (ES), awal tamat (EF), lewat mula (LS), lewat tamat (LF), jumlah apungan keseluruhan (TF) bagi semua aktiviti serta tandakan laluan genting dalam **Jadual II** di **Lampiran II**.

(6 markah)

(iv) Hitungkan kos projek mengikut jangka masa baru penamatan projek.

(2 markah)

Q2 *Information regarding activities for undertaking a certain project are provided in Table Q2.*

(a) *Draw a critical path method precedence diagram for this project.*

(6 marks)

(b) *Use the format provided in Jadual I found in Appendix I (Lampiran I) to answer the following questions:*

(i) *Calculate the earliest project completion time.*

(2 marks)

(ii) *Calculate the Early Start (ES), Early Finish (EF), Late Start (LS), Late Finish (LF), Total Float (TF) for all activities, and indicate the critical path in the form of a table.*

(6 marks)

Table Q2: *Project Data*

Activity	Preceded by	Followed by	Duration (wks)	Activity Cost (RM)
A	-	B, C, D	2	4 000
B	A	E	2	5 000
C	A	F	5	1 000
D	A	G	3	3 000
E	B	H	4	2 000
F	C	H	2	1 200
G	D	I, J	5	2 000
H	E, F	I	7	7 700
I	H, G	K	3	9 000
J	G	K	6	3 000
K	I, J	L	3	6 000
L	K	-	4	4 800

(c)   *Assume that activity **E** is delayed by two weeks, activity **H** is delayed by one week and activiyi **K** is delayed by three weeks.*

        (i)   *Draw a critical path method diagram (CPM) to represent the revised schedule.*

                                                                     (6 marks)

        (ii)   *State the new earliest project completion period.*

                                                                      (2 marks)

        (iii)   *Calculate the Early Start (ES), Early Finish (EF), Late Start (LS), Late Finish (LF), Total Float (TF) for all activities, and indicate the critical in **Jadual II** found in **Appendix II** (Lampiran II).*

                                                                    (6 marks)

        (iv)   *Determine the project cost based on the revised schedule.*

                                                                      (2 marks)

BAHAGIAN B (40 markah)

S3 Projek biasanya dikategorikan sebagai kekangan-masa atau kekangan-sumber. Penjadualan projek jenis kekangan-masa berfokus pada penggunaan sumber, padahal penjadualan projek berkekangan-sumber berfokus pada pengutamaan penggunaan sumber yang terhad supaya projek untuk meminimumkan kelewatan . *Heuristics* (garis panduan kasar) digunakan bagi memudahkan kaedah pengutamman penjadualan sumber.

(a) Nyatakan **LIMA (5)** langkah yang harus dilakukan dalam proses perancangan sumber.

(5 markah)

(b) Terangkan kaedah penjadualan *Splitting* dan *Multi-tasking* yang digunakan dalam projek yang berkekangan-sumber supaya dapat menjadualkan projek dengan lebih baik atau meningkatkan penggunaan sumber.

(4 markah)

(c) Anda adalah pengurus Projek Road I, dan telah menyiapkan penjadualan berdasarkan maklumat CPM di **Rajah S3** bagi satu projek dimana sumber utama adalah *backhoe*. Penjadualan ini berdasarkan menggunakan 3 *backhoe*. Tiba-tiba anda telah menerima permintaan dari pengurus Projek Road II yang secara mendesak meminta 1 *backhoe* dari anda. Anda setuju meminjam 1 *backhoe*.

Lengkapkan **Rajah S3** bagi Projek Road I di Lampiran III dan sediakan satu penjadualan sumber dengan menggunakan **Jadual S3** (c) (i) dan (ii) di Lampiran IV supaya dapat menyiapkan projek dalam 12 minggu dengan menggunakan hanya 2 *backhoe*. Aktiviti E dan F memerlukan 2 'backhoe', dan aktiviti A, B, C dan D memerlukan 1 *backhoe*. Proses meratakan sumber dengan menggunakan kaedah *heuristic* selari harus dilakukan tanpa memecahkan aktiviti serta menggunakan agihan secara manual supaya sumber dapat diagihkan dengan sebaik mungkin tanpa melebihi had sumber serta tiada kerja lebihan masa bagi kerja setiap hari.

(11 markah)

LEGEND:

ES	ID	EF
SL	RES	SL
LS	DUR	LF
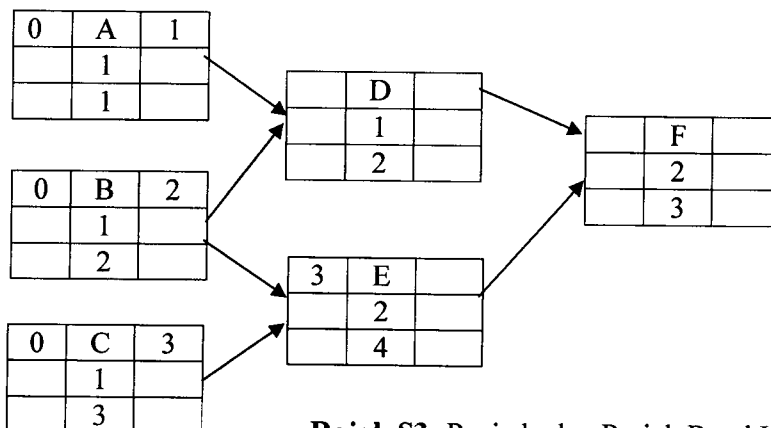
Rajah S3: Penjadualan Projek Road I

Q3   Projects are categorized as time-constrained or resource-constrained. The scheduling of time-constrained projects focuses on resource use, whilst scheduling of resource-constrained focuses on prioritizing use of limited resources in order to minimize project delay. Heuristics are used for the purpose of prioritizing the scheduling of resources.

(a)   State **FIVE (5)** steps that need to be undertaken in the process of resource planning.

(5 marks)

(b)   Explain the method of Splitting dan Multi-tasking that is used on projects that are resource-constrained in order to schedule projects more effectively or optimize resource use.

(4 marks)

(c)   You are the project manager for Project Road I, and you have prepared the project schedule involving the use of backhoes as the main resource based on information in **Figure Q3**. The resource scheduling is based on using 3 backhoes. Suddenly, you have a request from the project manager from Project Road II who persistently requests 1 backhoe to be loaned to his project, and you agree

Complete **Figure Q3** for Project Road I in **Appendix III** and prepare a resource schedule using **Jadual S3** (c) (i) dan (ii) found in **Appendix IV** in order to complete the project in 12 weeks using only 2 backhoes. Activity E dan F requires 2 'backhoes', and activity A, B, C dan D require 1 backhoe each. The process of resource levelling using the parallell method is to be used without activity splitting, multitasking, overtime with the aim of allocating resources effectively without exceeding resource limitations.

(11 marks)

Figure Q3 : Schedule for Project Road I
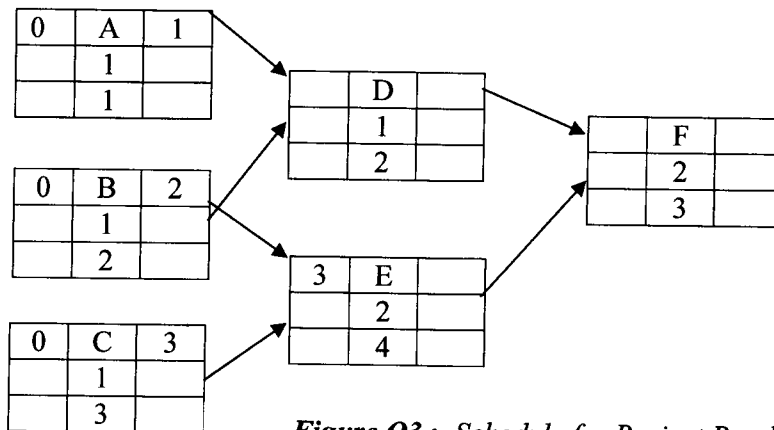
LEGEND:

ES	ID	EF
SL	RES	SL
LS	DUR	LF

S4   Informasi satu projek pembinaan yang tepat dan senang diakses pada masa keputusan harus diambil boleh membantu meningkatkan produktiviti satu projek.

(a)   Terangkan secara ringkas **TIGA (3)** laporan berikut yang membantu dalam proses membuat keputusan mengurus projek pembinaan:

(i)   Laporan mingguan

(1 markah)

(ii)   Laporan bulanan

(1 markah)

(iii)   Laporan *trend*

(1 markah)

(b)   Satu daripada kaedah yang boleh digunakan bagi tujuan merancang satu projek yang ada aktiviti berturutan adalah dengan menggunakan *Linear Scheduling*. Berikut dalam **Jadual S4** adalah maklumat sebuah projek perpaipan sejauh 5, 000 m.

Jadual S4: Produktiviti dan Tempoh Aktiviti Projek Perpaipan

Aktiviti	Produktiviti (meter sehari)	Jangkamasa bagi 5, 000 m
Ukur Tanah dan Layout	500	10
Membersihkan Kawasan	400	13
Menggali Trench	200	25
Meletak Paip	300	17
Backfill	250	20

(i)   Lakarkan Rajah *Velocity* menggunakan kertas graf yang disediakan dan tandakan dengan jelas aktiviti yang berkonflik.

(5 markah)

(ii)   Lakarkan Rajah *Velocity* dengan menyatakan buffer yang diperlukan antara aktiviti supaya terdapat Rajah *Velocity* yang tidak berkonflik.

(5 markah)

(iii)   Tentukan tempoh menyiapkan projek tanpa aktiviti berkonflik yang disediakan di S4 (ii) mengikut perancangan anda.

(1 markah)

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(c)   Menyiapkan projek pembinaan mengikut tempoh yang telah ditetapkan, terutama bagi projek yang kompleks, merupakan satu cabaran utama bagi pengurus projek. Kelewatan yang diambilkira berdasarkan perancangan asal boleh dibahagikan kepada tiga kategori. Huraikan secara ringkas **TIGA (3)** kategori tersebut.

(6 markah)

Q4   Construction project information that is accurate and easy to access during decision making can help in productivity improvement of a project.

(a)   Briefly explain **THREE (3)** of the following reports that are used in the process of decision making.

(i)   Weekly reports

(1 mark)

(ii)   Monthly reports

(1 mark)

(iii)   Trend reports

(1 mark)

(b)   One of the methods that can be used for the purpose of project planning that has repetitive activities is that of Linear Scheduling.

The following information in **Table Q4** refers to a piping project of 5, 000 m length.

Table Q4: Productivity and Duration of Piping Project Activities

Activity	Productivity (meter per day)	Duration for 5, 000 m
Land Survey and Layout	500	10
Site Clearance	400	13
Trench Excavation	200	25
Pipe Laying	300	17
Backfill	250	20

(i)   Sketch a Velocity Diagram using graf paper indicating clearly activities that are conflicting.

(5 marks)

(ii)   Sketch a Velocity Diagram stating clearly the buffer that needs to be considered in the planning in order to avoid conflicts

(5 marks)

(iii)   Determine the completion period for the project that is planned in **Q4 (ii)** that does not have conflicts.

(1 mark)

*(c)   Completing a construction project within the specified completion period, especially for complex projects, poses a major challenge for the proejct manager. Delay in completing the project according to the specified completion period can be classified into three categorizes. Briefly explain the **THREE (3)** categories.*

(6 marks)

S5   Pengurusan sumber adalah sebahagian daripada kerja perancangan program atau perancangan rangkaian kerja bagi suatu projek pembinaan.

(a)   Nyatakan **LIMA (5)** anggapan yang dibuat dalam merancang projek pembinaan menggunakan kaedah genting (CPM).

(5 markah)

(b)   En. Johan adalah pemilik satu projek ternakan ikan ingin menyiapkan aktiviti mengorek tiga kolam ikan dalam tempoh 3 minggu. Kos pengorekan setiap kolam adalah RM 1,000. Walau bagaimanapun, selepas 2 minggu hanya satu kolam telah siap dikorek dan En. Johan telah membelanjakan RM 3,000.

(i)   Hitungkan Perbezaan Penjadualan (*schedule variance, SV*) selepas tempoh 2 minggu projek dilaksanakan.

(2 markah)

(ii)   Hitungkan Perbezaan Kos (*cost variance, CV*) selepas tempoh 2 minggu projek dilaksanakan.

(2 markah)

(iii)   Lakar Keluk-S (*S-curves*) bagi projek En. Johan berasaskan analisis pada minggu yang kedua.

(5 markah)

(iv)   Hitungkan Indeks Prestasi Kos bagi projek tersebut selepas 2 minggu.

(3 markah)

(v)   Hitungkan Indeks Prestasi Penjadualan bagi projek tersebut selepas 2 minggu.

(3 markah)

Q5   Resource management is an important aspect of programme planning or network planning for a construction project.

   (a)   State **FIVE (5)** assumptions made in project planning using the critical path method (CPM).

(5 marks)

   (b)   Mr. Johan is the owner of a fish farm and he wishes to complete the activity of digging three fish ponds within 3 weeks. The cost of digging each fish pond is RM 1,000. However after 2 weeks, only one fish pond was dug whilst Mr. Johan had already spent RM 3,000.

      (i)   Calculate the schedule variance (SV) after a period of 2 weeks since the project was started.

(2 marks)

      (ii)   Calculate the cost variance (CV)) after a period of 2 weeks since the project was started.

(2 marks)

      (iii)   Draw the S-curve for Mr. Johan's project based on the analysis of the second week of the project's progress.

(5 marks)

      (iv)   Calculate the Cost Performance Index of the project after the second week.

(3 marks)

      (v)   Calculate the Schedule Performance Index of the project after the second week.

(3 marks)

KERTAS SOALAN TAMAT

END OF QUESTION PAPER

SEMESTER	:	I	Lampiran I (*Appendix I*)

SEMESTER   : I

SESI   : 2011 / 2012

PROGRAM   : 4 BPD

NAMA KURSUS : PENJADUALAN DAN PERANCANGAN BINAAN

KOD KURSUS   : BPF 4283

Nombor Matrik: _____

Gunakan Jadual di bawah bagi menjawab S2 (b) (i) dan S2 (b) (ii)

Jadual I

Aktiviti (*Activity*)	Jangka Masa (Minggu/*wks*) *Duration*	ES (Awal Mula)	EF (Awal Tamat)	LS (Lewat Mula)	LF (Lewat Tamat)	TF (*Jumlah Apungan*)	KRITIKAL? (Ya/ Tidak) *Critical? (Yes/No)*

Jawapan: S2 (b) (i) ……………………………………..

(Answer)

      S2 (b) (ii) **Guna Jadual I di atas**

                        Use Jadual I above

SEMESTER	:	I	Lampiran II *(Appendix II)*
SESI	:	2011 / 2012	
PROGRAM	:	4 BPD	
NAMA KURSUS	:	PENJADUALAN DAN PERANCANGAN BINAAN	
KOD KURSUS	:	BPF 4283	

Nombor Matrik: _____

Gunakan Jadual II di bawah bagi menjawab S2 (c) (iii).
Use Jadual II below to answer S2 (c) (iii).

Jadual II

Akiviti *(Activity)*	Jangka Masa (Minggu/wks) *Duration*	ES (Awal Mula)	EF (Awal Tamat)	LS (Lewat Mula)	LF (Lewat Tamat)	TF (Jumlah *Apungan*)	KRITIKAL? (Ya/ Tidak) *Critical (Yes/No)*	Kos Aktiviti (RM) *Activity Cost*

Jawapan: S2 (c) (ii) ....
Answer
        S2 (c) (iv) ....

Nombor Matrik: _____

0	A	1
	1	
	1	

	D	
	1	
	2	

0	B	2
	1	
	2	

3	E	
	2	
	4	

0	C	3
	1	
	3	

	F	
	2	
	3	

LEGEND:

ES	ID	EF
SL	RES	SL
LS	DUR	LF
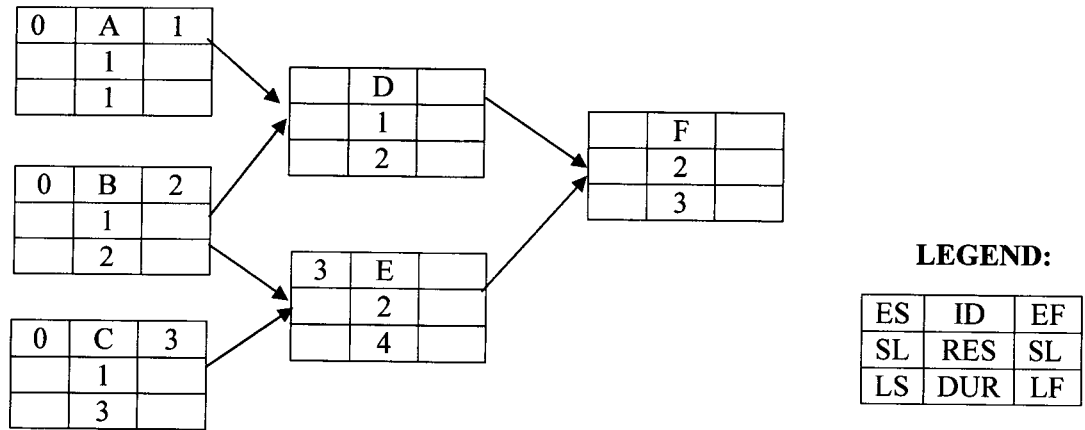
Rajah S3 : Penjadualan Projek Tower I
Schedule for Tower 1 Project

Lampiran IV *(Appendix IV)*

Nombor Matrik: _____

Jadual S3 (c) (i): Penjadualan Sumber Asal
Original Resource Scheduling

ID	RES	DUR	ES	LF	SLK	0	1	2	3	4	5	6	7	8	9	10	11	12
Resources scheduled																		
Resources available						3	3	3	3	3	3	3	3	3	3	3	3	3

Jadual S3 (c) (ii): Penjadualan Kekangan-Sumber
Resource-constrained Scheduling

ID	RES	DUR	ES	LF	SLK	0	1	2	3	4	5	6	7	8	9	10	11	12
Resources scheduled																		
Resources available						2	2	2	2	2	2	2	2	2	2	2	2	2