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DDPB

UTM UNIVERSITI TEKNOLOGI MALAYSIA

Sekolah Pendidikan Profesional dan Pendidikan Berterusan (UTMSPACE)

FINAL EXAMINATION / *PEPERIKSAAN AKHIR*
SEMESTER 1 – SESSION 2016 / 2017
PROGRAM KERJASAMA

COURSE CODE *KOD KURSUS*	:	DDPS2033 / DDPS2213
COURSE NAME *NAMA KURSUS*	:	HIGHER ENGINEERING MATHEMATICS *MATEMATIK KEJURUTERAAN TINGGI*
YEAR / PROGRAMME *TAHUN / PROGRAM*	:	2 / DIPLOMA IN ENGINEERING *2 / DIPLOMA KEJURUTERAAN*
DURATION *TEMPOH*	:	2 HOURS 30 MINUTES *2 JAM 30 MINIT*
DATE *TARIKH*	:	OKTOBER 2016

INSTRUCTIONS:
ARAHAN:

1. Answer **ALL** questions.
   *Jawab **SEMUA** soalan.*
2. A list of formulae and tables are given for reference.
   Senarai formula dan jadual disertakan sebagai rujukan.

(You are required to write you[redacted]

1. (a) **Use the method of separation of variables to solve the equation:**

Guna kaedah pemisahan pembolehubah untuk menyelesaikan persamaan:

$$\frac{dy}{dx} = \frac{3x^2}{2y + \cos y}$$

$$(2y + \cos y)\,dy = 3x^2\,dx$$

(5M)

(b) **Find the integrating factor of equation and hence solve the equation.**

Dapatkan faktor pengamir persamaan dan seterusnya

3. (a) **Find the partial derivatives f_x , f_y , f_{yx} and f_{xx} :**

Dapatkan terbitan separa f_x , f_y , f_{yx} dan f_{xx} :

$$f(x,y) = 3x + y^3 e^{5x} - 3y$$

(5M)

(b) **If $z = 3\sin x - \cos y$, where $x = t^2$ and $y = 3t$, find $\frac{dz}{dt}$.**

Jika $z = 3\sin x - \cos y$, dengan $x = t^2$ dan $y = 3t$, dapatkan $\frac{dz}{dt}$.

(5M)

(c) **Find any maximum, minimum and saddle points of the function:**

Dapatkan titik maksimum, titik minimum dan titik pelana bagi fungsi:

$$f(x,y) = x^3 - xy + y^3$$

(5M)

4. (a) **Evaluate the double integral**

Nilaikan kamiran ganda dua

$$\iint_R (4 - x - y)\, dxdy \quad , \quad R = \{(x,y): 0 \le x \le 1,\ 0 \le y \le 2\}$$

(5M)

(b) **Reverse the order of integration**

Tukartertib pengamiran

$$\int_0^2 \int_{y/2}^{1} \frac{6}{x}\, dxdy$$

and hence evaluate the resulting integral.

dan kemudian nilaikan kamiran yang terhasil.

(6M)

(c) **Use polar coordinates to evaluate the double integral**

Gunakan kamiran kutub untuk menilaikan kamiran gandadua

$$\iint_R \frac{1}{1+x^2+y^2}\, dA$$

***R* is the sector in the first quadrant bounded by** $y=0,\ y=x$ **and** $x^2+y^2=4$.
R ialah sektor dalam sukuan pertama yang dibatasi oleh $y=0,\ y=x$ *dan* $x^2+y^2=4$.

(6M)

END OF QUESTION PAPER

KERTAS SOALAN TAMAT

APPENDIX

A. Formulae

B. The method of undetermined coefficients

Solution of homogeneous equation: $ay'' + by' + cy = 0$

Auxiliary equation: $am^2 + bm + c = 0$

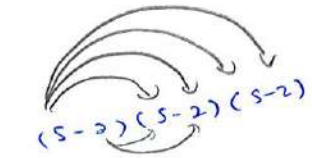
Roots of $am^2 + bm + c = 0$	General solution, y_h
1. real and unequal: m_1 and m_2	$y_h = Ae^{m_1 x} + Be^{m_2 x}$
2. real and equal: $m = m_1 = m_2$	$y_h = (A + Bx)e^{mx}$
3. complex numbers: $m_1 = \alpha + \beta i$; $m_2 = \alpha - \beta i$	$y_h = e^{\alpha x}(A\cos\beta x + B\sin\beta x)$

Particular integrals of nonhomogeneous equation: $ay'' + by' + cy = f(x)$

$f(x)$	Roots of auxiliary equation: m_1, m_2	y_p
$A_n x^n + A_{n-1}x^{n-1} + \cdots + A_1 x + A_0$	$m_1 \neq 0$ and $m_2 \neq 0$	$B_n x^n + B_{n-1}x^{n-1} + \cdots + B_1 x + B_0$
	$m_1 = 0$ or $m_2 = 0$	$(B_n x^n + B_{n-1}x^{n-1} + \cdots + B_1 x + B_0)x$
$Ke^{\alpha x}$	$m_1 \neq \alpha$ and $m_2 \neq \alpha$	$Ce^{\alpha x}$
	$m_1 = \alpha$ or $m_2 = \alpha$	$Cxe^{\alpha x}$
	$m_1 = \alpha$ and $m_2 = \alpha$	$Cx^2 e^{\alpha x}$
$K\cos\beta x$ or $K\sin\beta x$	$m_1 \neq i\beta$ and $m_2 \neq i\beta$	$C_1\cos\beta x + C_2\sin\beta x$
	$m_1 = i\beta$ or $m_2 = i\beta$	$(C_1\cos\beta x + C_2\sin\beta x)x$

C. Table of Laplace Transforms $\mathcal{L}\{f(t)\} = F(s)$

$f(t)$	$F(s)$
a	$\frac{a}{s}$
e^{at}	$\frac{1}{s-a}$
$\sin at$	$\frac{a}{s^2+a^2}$
$\cos at$	$\frac{s}{s^2+a^2}$
$e^{at}f(t)$	$F(s-a)$
$e^{at}\sin bt$	$\frac{b}{(s-a)^2+b^2}$
$e^{at}\cos bt$	$\frac{(s-a)}{(s-a)^2+b^2}$
$t^n,\ n=1,\ 2,\ 3,\ \ldots$	$\frac{n!}{s^{n+1}}$
$t^n e^{at}$	$\frac{n!}{(s-a)^{n+1}}$
$y(t)$	$Y(s)$
$y'(t)$	$sY(s)-y(0)$
$y''(t)$	$s^2Y(s)-sy(0)-y'(0)$



$s^2 - 2s + s^2 - 2s - 2s + 4 - 2s + 4$

$+ s^2 -$