

**Premier University**  
**Department of Computer Science and Engineering**  
**2<sup>nd</sup> Semester Final Exam-November, 2016**  
**Course Title: Engineering Mathematics II**  
**Course Code: MAT 107**

**Total Marks: 50**

**Time: 3 hours**

Answer any five of the following questions (10 × 5 = 50)

- Q1. a)** Rewrite the integral  $\int_0^{10} [(x^2 - 3)^2 (x(x-1)^2)] dx$  by using the Method of Partial Fractions. 5  
5  
**b)** Evaluate this definite integral.
- Q2. a)** Evaluate  $\int_0^1 \int_0^1 \int_0^1 [xy - yz - zx] dx dy dz$ , this definite integral. 5  
**b)** Compute the indefinite integral  $\int e^x \sin(x) dx$ . 5
- Q3.** If  $[a, b] = [-3, 4]$ ,  $P = \{-3, -2, 1, 5/2, 4\}$ , and  $f(x) = x^2 + 1$ ; then find  $U_f(P)$  and  $L_f(P)$ . 10
- Q4. a)** Assume that a sphere of ice melts at a rate proportional  $[$ , with constant of proportionality  $k=10,$ ] to its surface area: Find an expression for the volume at any time  $t$ . 5  
5  
**b)** Solve  $x^2(dy/dx) = xy - 2y^2$
- Q5.** Given  $(y + e^{2x})dx + xdy = 0$ , 2  
**a)** Determine (exhibit the method) if it is exact. 6  
**b)** Find general solution 2  
**c)** Check your solution by implicit differentiation. 5
- Q6. a)** Solve  $x(dy/dx) + 2y = xy^3$  5  
**b)** Solve  $(dy/dx) + y = 2\cos(x)$  5
- Q7.** Solve  $y'' + 3y' - y = 2e^x \sin(2x)$ , or Find the fundamental system of solutions of  $y'' + 3y' - y = 0$  by showing that your solution functions are linearly independent (of each other, by computing relevant Wronskian). 10

**Premier University**  
**Department of Computer Science & Engineering**  
**2<sup>nd</sup> Semester Final Examination, May 2017**  
**Course Title: Engineering Math II**  
**Course No. : MAT 107**

**Time: 3 Hours**

**Marks : 50**

**Answer any five (5) from following seven (7) questions.**

- Q1** (a) (5 marks) Rewrite the integral  $\int e^x [dx/(x^2 + x + 1)]$  by using the Method of Partial Fractions; (b) (5 marks) Evaluate this definite integral. 5+5
- Q2** (a) Find the solution for the initial value problem 5+5  

$$\frac{dl}{dt} + \frac{10l}{2t+5} = 10; t > 0, l(0) = 0$$
 (b) Solve  $(D^3 + 1)y = 3 + e^{-x} + 5e^{2x}$
- Q3** (a) Evaluate  $\int_0^2 \int_0^\infty \int_0^{10} [x-y^2-z^3] dx dy dz$ , this definite integral. 5+5  
 (b) Compute the indefinite integral  $\int e^x \cos((\pi x)/3) dx$ .
- Q4** (a) Solve the following differential equation 5+5  

$$\frac{dy}{dx} + \frac{2}{x} y = \frac{y^3}{x^4}$$
 (b) Solve  $(D^2 - 4D + 3)y = \cos 2x$ .
- Q5** Given  $dy/dx = [-\cos(xy) + xy \sin(xy)] / [1 - x^2 \sin(xy) + 2y] = 0$ . (a) (2 marks) Determine (by exhibiting a method) if it is exact. (b) (5 marks) Find general solution. (c) (2 marks) Check your solution by implicit differentiation. (d) (1 mark) Find particular solution if  $y(2)=6$ . 10
- Q6** (a) If  $I_{m,n} = \int \cos^m x \sin nx dx$ , then prove that  $I_{m,n}(m+n) = -\cos^m x \cos nx + m I_{m-1,n-1}$  and 5+5  
 evaluate  $\int_0^{\pi/4} \cos^2 x \sin 4x dx$ .  
 (b) Define Beta and Gamma function. Also evaluate following integral  

$$\int_0^{\pi/2} x \sin^m x \cos^4 x dx$$
- Q7** Solve  $y'' + 3y' - y = 4e^x \cos(4x)$  by following the Method of Undetermined Coefficients. or find the fundamental system of solutions of  $y'' + 3y' - y = 0$  by showing that your solution functions are linearly independent (of each other, by computing relevant Wronskian). 10

**Premier University**  
**Department of Computer Science & Engineering**  
**2<sup>nd</sup> Semester Final Examination, May 2017**  
**Course Title: Engineering Math II**  
**Course No. : MAT 107**

**Marks : 50**

**Time: 3 Hours**

Answer any five (5) from following seven (7) questions.

- Q1** (a) (5 marks) Rewrite the integral  $\int e^{2x} [dx/(x^2 + x + 1)]$  by using the Method of Partial Fractions; (b) (5 marks) Evaluate this definite integral. 5+5
- Q2** (a) Find the solution for the initial value problem 5+5  

$$\frac{dl}{dt} + \frac{10l}{2t+5} = 10; t > 0, l(0) = 0$$
  
 (b) Solve  $(D^3 + 1)y = 3 + e^{-x} + 5e^{2x}$
- Q3** (a) Evaluate  $\int_0^2 \int_0^4 \int_0^1 [x-y^2-z^3] dx dy dz$ , this definite integral. 5+5  
 (b) Compute the indefinite integral  $\int e^{3x} \cos(\pi x)/3 dx$ .
- Q4** (a) Solve the following differential equation 5+5  

$$\frac{dy}{dx} + \frac{2}{x}y = \frac{y^3}{x^3}$$
  
 (b) Solve  $(D^2 - 4D + 3)y = \cos 2x$ .
- Q5** Given  $dy/dx = [-\cos(xy) + xy \sin(xy)]/[-x^2 \sin(xy) + 2y] = 0$ . (a) (2 marks) Determine (by exhibiting a method) if it is exact. (b) (5 marks) Find general solution. (c) (2 marks) Check your solution by implicit differentiation. (d) (1 mark) Find particular solution if  $y(2) = 6$ . 10
- Q6** (a) If  $I_{m,n} = \int \cos^m x \sin nx dx$ , then prove that  $I_{m,n}(m+n) = -\cos^m x \cos nx + m I_{m-1,n-1}$  and 5+5  
 evaluate  $\int_0^{\pi/2} \cos^2 x \sin 4x dx$ .  
 (b) Define Beta and Gamma function. Also evaluate following integral  

$$\int_0^{\pi/2} x \sin^4 x \cos^4 x dx$$
- Q7** Solve  $y'' + 3y' - y = 4e^x \cos(4x)$  by following the Method of Undetermined Coefficients, or find the fundamental system of solutions of  $y'' + 3y' - y = 0$  by showing that your solution functions are linearly independent (of each other, by computing relevant Wronskian). 10

**Premier University**  
**Department of Computer Science & Engineering**  
**2<sup>nd</sup> Semester Final Examination, May 2017**  
**Course Title: Engineering Math II**  
**Course No. : MAT 107**

**Time: 3 Hours**

**Marks : 50**

**Answer any five (5) from following seven (7) questions.**

**Q1** (a) (5 marks) Rewrite the integral  $\int_0^{2e} [dx/(x^2 + x + 1)]$  by using the Method of Partial Fractions; (b) (5 marks) Evaluate this definite integral. 5+5

**Q2** (a) Find the solution for the initial value problem 5+5  

$$\frac{dl}{dt} + \frac{10l}{2t+5} = 10; t > 0, l(0) = 0$$
  
 (b) Solve  $(D^3 - 1)y = 3 + e^{-x} + 5e^{2x}$

**Q3** (a) Evaluate  $\int_0^{2\pi} \int_0^{3\pi} \int_0^{10} [x-y^2-z^3] dx dy dz$ , this definite integral. 5+5  
 (b) Compute the indefinite integral  $\int e^{ax} \cos(ax/3) dx$ .

**Q4** Solve the following differential equation 5+5  

$$\frac{dy}{dx} + \frac{2}{x}y = \frac{y^2}{x}$$
  
 (b) Solve  $(D^2 - 4D + 3)y = \cos 2x$ .

**Q5** Given  $dy/dx = [-\cos(xy) + xy \sin(xy)]/[1 - x^2 \sin(xy) + 2y] = 0$ . (a) (2 marks) Determine (by exhibiting a method) if it is exact, (b) (5 marks) Find general solution, (c) (2 marks) Check your solution by implicit differentiation, (d) (1 mark) Find particular solution if  $y(2)=6$ . 10

**Q6** (a) If  $I_{m,n} = \int \cos^m x \sin nx dx$ , then prove that  $I_{m,n}(m+n) = -\cos^m x \cos nx + m I_{m-1,n-1}$  and 5+5  
 evaluate  $\int_0^{\pi/4} \cos^2 x \sin 4x dx$ .  
 (b) Define Beta and Gamma function. Also evaluate following integral  

$$\int_0^{\pi/2} x \sin^6 x \cos^4 x dx$$

**Q7** Solve  $y'' + 3y' - y = 4e^x \cos(4x)$  by following the Method of Undetermined Coefficients, or find the fundamental system of solutions of  $y'' + 3y' - y = 0$  by showing that your solution functions are linearly independent (of each other, by computing relevant Wronskian). 10



Premier University  
Department of Computer Science & Engineering  
2<sup>nd</sup> Semester Final Exam, April 2016  
Course Code: MAT 107  
Course Title: Engineering Mathematics II

Total Marks: 50

Time: 3 Hours

Answer any *five (5)* from the following *seven (7)* questions.

- Q.1 a. Rewrite the integral  $\int_2^e (x^5 + 2)/(x^2 - 1)dx$  by decomposing into a polynomial and partial fractions. 05
- b. Evaluate the definite integral given in Q.1(a) if possible. 05
- Q.2 a. Evaluate  $\int_0^x \int_0^1 \int_0^y (x - y + z)dx dy dz$  05
- b. Compute the indefinite integral  $\int e^{-x} \cos(2x)dx$  05
- Q.3 If  $[a, b] = [-3, 5]$ ,  $P = \{-3, -1, 0, 3, 5\}$ , and  $f(x) = x^2 - x$ ; then find  $U_i(P)$  and  $L_i(P)$ . 10
- Q.4 a. Assume that a sphere of ice melts at a rate proportional to its surface area. Find an expression for the volume ( $V$ ) at any time  $t$  if  $V(0) = (4/3)\pi m^3$ . 05
- b. Solve (if possible)  $x^3 y \left(\frac{dy}{dx}\right) = x^2 y^2 - 2y^4$ ;  $y(0) = 0$  05
- Q.5 Given,  $(y + e^x)dx + xdy = 0$ .
- a. Determine (by exhibiting the method) if it is exact. 02
- b. Find a general solution of the above differential equation. 06
- c. Check your solution by implicit differentiation. 02
- Q.6 a. Solve  $\left(\frac{dy}{dx}\right) + y = x$ . 05
- b. Solve  $\left(\frac{dy}{dx}\right) + y = y^4$ , if possible. 05
- Q.7 Solve  $y'' + 2y' - 3y = 2e^x$  by adopting Method of Un-determined Coefficients and Variation of Parameters. 10

**Premier University**  
 Department of Computer Science & Engineering  
**2<sup>nd</sup> Semester Final Exam, November 2015**  
 Course Title: Engineering Math II  
 Course Code: MAT 107

Marks: 50

Time: 3 hours

Answer any five (5) from the following questions

- Q.1 a. Rewrite the integral  $\int_4^{10} [(x^5 + 2)/(x^2 - 4)]dx$  by decomposing into a polynomial and partial fractions. 5  
 b. Evaluate this definite integral, if possible. 5
- Q.2 a. Evaluate  $\int_0^1 \int_0^x \int_0^y (x+y+z) dx dy dz$ . 5  
 b. Compute the indefinite integral  $\int e^{-2x} \sin(2x) dx$ . 5
- Q.3 a. If  $[a, b] = [-4, 4]$ ,  $P = \{-4, -1, 0, 3, 4\}$ , and  $f(x) = -x^2 + x$ ; then find  $U_f(P)$  and  $L_f(P)$ . 10
- Q.4 a. Assume that a sphere of ice melts at a rate proportional to its surface area. Find an expression for the volume ( $V$ ) at any time  $t$  if  $V(0) = 10m^3$ . 5  
 b. Solve  $x^3(dy/dx) = x^2y - 2y^3$ . 5
- Q.5 Given  $(y + e^x)dx + xdy = 0$ .  
 a. Determine (by exhibiting the method) if it is exact. 2  
 b. Solve it. 6  
 c. Check your solution by implicit differentiation. 2
- Q.6 a. Solve  $(dy/dx) + (1/x)y = 3x^2$ . 10
- Q.7 a. Solve  $y'' + 2y' - 3y = 4e^{2x}$ . 10