King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
Math 260 (Term 041)
Major 2

Time Allowed: 1 ¼ Hrs

Name:……………………..ID#…………………………Section …………

Note

No programmable calculators and mobile phones allowed in the examination hall.
For all questions show calculations in support of your answer.

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Q#1 Use method of undetermined coefficients to solve \( y''(x) - 16y(x) = -8xe^{-4x} \)
subject to \( y(0) = 1 \) and \( y'(0) = 2 \).
Q#2 Given the DE \( (D - 2)^3 (D^2 + 16)^4 y = x \cos 4x + x^2 e^{2x} + 1 \), find its particular solution (do not determine constants).
Q#3 Use method of variation of parameters to solve \( y''(x) - 8y'(x) + 16y(x) = e^{4x} \).
Q#4

(a): Given \( V_1, V_2, \) and \( V_3 \in \mathbb{R}^4 \) such that \( V_1 = (3, 0, 1, 2), V_2 = (1, -1, 0, 1), \) and \( V_3 = (1, 2, 1, 0). \) Use a result that allows use of determinants to find if the given vectors are linearly independent or not?

(b): Verify your answer using RREF method.
Q#5 Find a basis for the solution space of the system
\[ \begin{align*}
    x_1 - 3x_2 - 9x_3 - 5x_4 &= 0, \\
    2x_1 + x_2 - 4x_3 + 11x_4 &= 0, \\
    x_1 + 3x_2 + 3x_3 + 13x_4 &= 0. 
\end{align*} \]
Give also the dimension of the space generated by this basis.
Q#6 Given \( y = \sum_{i=0}^{1} x^i \left( A_{i+1} \cos 2x + B_{i+1} \sin 2x \right) + (C + Dx + Ex^2)e^x \), construct the differential equation which satisfies it.