國立聯合大學 104 學年度

寒假轉學生招生考試試題紙

科目：工程數學甲　第 1 頁共 2 頁

選擇題(共 20 題，每題 5 分)

1. Determine the volume of tetrahedron with vertices of P_1 (-1, 0, 1), P_2(2, 1, 5), P_3(2, -1, 4) and P_4(-2, 1, 4) :
   (A) 22 (B) 6 (C) $\frac{1}{6}$ (D) $\frac{22}{6}$

2. Find the equation of plane that contains (-1, 1, 6), (2, 0, 1) and (3, 0, 0) points : (A) $x-2y+z=3$
   (B) $x+2y+z=3$ (C) $x-2y+5z=3$ (D) $x+2y+5z=3$

3. $y=e^x\cos x+e^x\sin x$, find $\frac{dy}{dx}$=? (A) $e^x\cos x$ (B) $2e^x\cos x$ (C) $e^x\sin x$ (D) $2e^x\sin x$

4. Find $\int xe^x dx$ =? (A) xe^x+e^x+c (B) xe^x+c (C) xe^x-e^x+c (D) $xe^{-x}+c$

5. Find the solution of $(x^2-1)\frac{dy}{dx}+2xy=0$: (A) $(x^2-1)=cy$ (B) $y(x^2-1)+x^2y=c$
   (C) $yx^2-y+x^2=c$ (D) $y(x^2-1)=c$

6. Find the solution of $(2x+3y-2)dx+(3x-4y+1)dy=0$: (A) $x^2+3xy-2x-2y^2+y=c$
   (B) $x^2+6xy-2x-2y^2+y=c$ (C) $x^2+3xy-2y^2=c$ (D) $x^2+6xy-2y^2=c$

7. Find the solution of $y''-4y'+4y=0$: (A) $y=C_1e^{2x}+C_2$ (B) $y=C_1e^{-2x}+C_2$
   (C) $y=C_1e^{2x}+C_2xe^{2x}$ (D) $y=e^{2x}(C_1\cos x+C_2\sin x)$

8. Find the solution of $y''-2y'=0,\ y(0)=0,\ y(\frac{1}{2})=2-2e$: (A) $y=e^{2x}-1$ (B) $y=2-2e^{2x}$
   (C) $y=2e^{2x}$ (D) $y=e^{-2x}-1$

9. Find the Laplace transform of $f(t)=e^{-at}$: (A) $\frac{1}{s-1}$ (B) $\frac{a}{s-1}$ (C) $\frac{a}{s+1}$ (D) $\frac{1}{s+a}$

10. Find the inverse Laplace transform of $F(s)=\frac{-2s+6}{s^2+4}$: (A) $-3\cos 2t+2\sin 2t$ (B) $-2\cos 3t+3\sin 3t$
    (C) $-2\cos 2t+3\sin 2t$ (D) $-3\cos 3t+3\sin 3t$

11. Fine the Laplace transform of $f(t)=\int_0^t x\sin x\,dx$: (A) $\frac{2}{(s^2+1)^2}$ (B) $\frac{2}{s^2+1}$ (C) $\frac{2}{s(s^2+1)}$ (D) $\frac{2s}{s^2+1}$

12. Find solution of $y'-5y=e^{5x},\ y(0)=2$: (A) $2+xe^{-5x}$ (B) $2+xe^{5x}$ (C) $2e^{5x}+xe^{-5x}$
    (D) $2e^{5x}+xe^{5x}$

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科目：工程數學甲　第 2 頁共 2 頁

13.A constant force of 10 N in the direction of $\boldsymbol{a} = \boldsymbol{i} + \boldsymbol{j}$ moves a block on a frictionless surface from P1(4, 1, 0) to P2(7, 4, 0). Suppose distance is measured in meters. Find the work done. : (A) $30\ N.m$ (B) $30\sqrt{2}\ N.m$ (C) $60\ N.m$ (D) $60\sqrt{2}\ N.m$

14.Find the curl of the given vector field $F(x,y,z) = 4xy\boldsymbol{i} + (2x^2 + 2yz)\boldsymbol{j} + (3z^2 + y^2)\boldsymbol{k}$:
(A) 0 (B) $4y\boldsymbol{i} + 2y\boldsymbol{j} + 6z\boldsymbol{k}$ (C) $8y + 4z$ (D) $2y + 4z$

15.Find an equation of the plane contains (1, 1, 1) and is perpendicular to the line through (2, 6, -3) and (1, 0, -2). :
(A) $6x - y + z = 6$ (B) $x - y + 6z = 6$ (C) $x + 6y - z = 6$ (D) $6x + y - z = 6$

16.Evaluate the determinant of $A = \begin{pmatrix} 6 & 2 & 7 \\ -4 & -3 & 2 \\ 2 & 4 & 8 \end{pmatrix}$. : (A) 90 (B) 190 (C) -90 (D) -190

17.Find the inverse of $A = \begin{pmatrix} 2 & 2 & 0 \\ -2 & 1 & 1 \\ 3 & 0 & 1 \end{pmatrix}$. : (A) $\begin{pmatrix} 1 & 2 & 2 \\ -5 & 2 & 2 \\ -3 & -6 & 6 \end{pmatrix}$ (B) $\frac{1}{12}\begin{pmatrix} 1 & -2 & 2 \\ 5 & 2 & -2 \\ -3 & 6 & 6 \end{pmatrix}$
(C) $\begin{pmatrix} 1 & -2 & 2 \\ 5 & 2 & -2 \\ -3 & 6 & 6 \end{pmatrix}$ (D) $\frac{1}{12}\begin{pmatrix} 1 & 2 & 2 \\ -5 & 2 & 2 \\ -3 & -6 & 6 \end{pmatrix}$

18.Find the divergence of the given vector field $F(x,y,z) = (x^2y^3 - z^4)\boldsymbol{i} + 4x^5y^2z\boldsymbol{j} - y^4z^6\boldsymbol{k}$. :
(A) $2xy^3 + 8x^5yz - 6y^4z^5$ (B) $2xy^3\boldsymbol{i} + 8x^5yz\boldsymbol{j} - 6y^4z^5\boldsymbol{k}$ (C) 0 (D) $y^3\boldsymbol{i} + 4x^5\boldsymbol{j} - y^4\boldsymbol{k}$

19.Evaluate line integral of $\int_C xy^2dx$ on the quarter-circle C define by $x = 4\cos t, y = 4\sin t, 0 \le t \le \pi/2$. :
(A) 16π (B) $\frac{256}{3}$ (C) -64 (D) -16π

20.Find the directional derivative of $F(x,y,z) = xy^2 - 4x^2y + z^2$ at (1, -1, 2) in the direction of $6\boldsymbol{i} + 2\boldsymbol{j} + 3\boldsymbol{k}$.
(A) $9\boldsymbol{i} - 6\boldsymbol{j} + 4\boldsymbol{k}$ (B) $\frac{54}{7}$ (C) 54 (D) $(y^2 - 8xy)\boldsymbol{i} + (2x - 4x^2)\boldsymbol{j} + 2z\boldsymbol{k}$