VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD
B.E. (CBCS) II-Semester (New) Examinations, May/June-2018
Engineering Mathematics-II

Time: 3 hours   Max. Marks: 60

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. Define rank of a matrix.

2. Find the sum and product of Eigen values of the matrix $\begin{bmatrix} 10 & 0 & 8 \\ 4 & 9 & 6 \\ 2 & 7 & 5 \end{bmatrix}$

3. Solve: $(3x^2 + 2e^y)dx + (2xe^y + 3y^2)dy = 0$

4. Solve: $\cos^2 x \dfrac{dy}{dx} + y = \tan x$

5. Solve : $(D^2 + 2D + 1)y(x) = 0$

6. Find the particular integral of $(D^2 - 4D + 4)y(x) = \sin 3x$

7. Define Regular and singular points.

8. Express $x^2 - 5x + 1$ in terms of Legendre polynomials.

9. Evaluate $\displaystyle\int_0^1 \dfrac{1}{\sqrt{1-x^4}}dx$

10. Show that $\beta(m,n) = \beta(n,m)$

Part-B (5 × 8 = 40 Marks)
(All sub-questions carry equal marks)

11. a) Verify Cayley-Hamilton theorm for the Matrix $A = \begin{bmatrix} 3 & 2 & 4 \\ 4 & 3 & 2 \\ 2 & 4 & 3 \end{bmatrix}$ and find A^{-1}

    b) Find the matrix P which transforms the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ to the diagonal form.

12. a) Find the general solution of the differential equation $y' = y^2 - (2x-1)y + x^2 - x + 1$
    $y = x$ is a particular solution.

    b) Find the orthogonal trajectories of the family of circles passing through the points (0,2) and (0,-2).

13. a) Find the general solution of $(D^2 - 5D + 4)y = 65\sin 2x$

    b) Solve by variation of parameters $(D^2 - 2D + 1)y = e^x \log x$

14. a) Prove that $\int_{-1}^{1} x P_n(x) P_{n-1}(x) dx = \frac{2n}{4n^2-1}$

   b) Show that $P_n(1) = 1$

15. a) Show that $\int_0^\infty \frac{e^{-\sqrt{x}}}{x^{7/4}} dx = \frac{8}{3}\sqrt{\pi}$

   b) Prove that $\frac{d}{dx}\left[x^n J_n(x)\right] = x^n J_{n-1}(x)$

16. a) Find the Eigen values and Eigen vectors of the matrix $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$

   b) Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to the canonical form and specify the matrix of transform.

17. Answer any *two* of the following:

   a) Solve $\frac{d^2 y}{dx^2} + 4\frac{dy}{dx} + 4y = 6e^{-2x}\cos^2 x$

   b) Prove that $\int_{-1}^{1} P_m(x) P_n(x) dx = 0, m \neq n$

   c) Evaluate $\int_0^\infty t^4 e^{-2t^2} dt$ by using gama function.

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