80

Hall Ticket Number:

Code No.: 12006 AS

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (CBCS) II-Semester Advanced Supplementary Examinations, June/July-2017

Engineering Mathematics-II

Time: **3** hours Max. Marks: **70**

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

Part-A (10 × 2 = 20 Marks)

1. What is meant by rank of a matrix? Give an example of a 4×3 matrix whose rank is 2.
2. Find the index, signature of the quadratic form $x_1^2+2x_2^2-3x_3^2$
3. Solve $x\,dy+2y\,dx=xy\,dy$.
4. Find the general solution of the differential equation $y'+2xy=xe^{-x^2}$.
5. Solve $y''+3y'-4y=0$, if one of its solution is $y_1=e^x$.
6. Find a particular integral of $y''+6y'+9y=\sin 2x$.
7. Express x^3+2x^2+x-1 in terms of Legendre polynomials $P_n(x)$.
8. Find the value of $P_n'(-1)$.
9. Compute $\Gamma\,(1/2)$.
10. Find the general solution of the differential equation $x^2y''+xy'+\left(x^2-\frac{1}{16}\right)y=0$ in terms of Bessel functions.

Part-B (5 × 10 = 50 Marks)
(All bits carry equal marks)

11. a) Determine whether the vectors (1, -1, 0), (0, 1, -1), (0, 2, 1), (1, 0, 3) are linearly dependent. If so, find the relation between them.

    b) Diagonalize the matrix $A=\begin{pmatrix}3 & 1 & -1\\ -2 & 1 & 2\\ 0 & 1 & 2\end{pmatrix}$.

12. a) Solve $\left(3x^2y^4+2xy\right)dx+\left(2x^3y^3-x^2\right)dy=0$.

    b) A generator having e.m.f. 100 volts is connected in series with a 10 ohms resistor and an inductor of 2 henries. If the switch is closed at a time $t=0$, find the current at time $t>0$.

13. a) Apply the method of variation of parameters to solve $y''-2y'=e^x\sin x$.

    b) Find the general solution of Euler-Cauchy equation $x^2y''-2xy'-4y=6x^2+4\log x$.

14. a) State the generating function for Legendre polynomials and hence prove that

    i) $P_n(1)=1$ ii) $P_n(-1)=(-1)^n$ and iii) $P_n(-x)=(-1)^n P_n(x)$.

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

Contd... 2

15. a) State and prove the relation between Beta and Gamma functions.

    b) Express $J_4(x)$ in *terms of* $J_0(x)$ *and* $J_1(x)$.

16. a) Verify Cayley-Hamilton theorem for $A = \begin{bmatrix} 3 & 2 & 4 \\ 4 & 3 & 2 \\ 2 & 4 & 3 \end{bmatrix}$ and hence find A^{-1}.

    b) Find the orthogonal trajectories of the family of curves $r = c(1+\cos\theta)$, where c is a parameter.

17. Answer any ***two*** of the following:

    a) Find all non zero solutions of the boundary value problem
    $y^{iv} - k^4 y = 0, \;\; y(0) = 0, y''(0) = 0, \; y(\pi) = 0, \; y''(\pi) = 0$.

    b) Find the power series solution of the differential equation $(1-x^2)y'' - 2xy' + 2y = 0$ about the origin.

    c) Evaluate $\int_0^\infty \frac{x^a}{a^x}\, dx$, $a > 1$, using Beta and Gamma functions.