Hall Ticket Number:

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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD
B.E. I Year II - Semester (New) Examinations, May - 2016
Mathematics-II

Time: **3** hours Max. Marks: **50**

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

Part-A (15 Marks)

1. Find the value of `a' so that the vector $(x+3y)\vec{i}+(y-2z)\vec{j}+(x+az)\vec{k}$ is solenoidal. [1]
2. Solve $\left[\frac{e^{-2\sqrt{x}}}{\sqrt{x}}-\frac{y}{\sqrt{x}}\right]\frac{dx}{dy}=1$ [1]
3. Solve $(D^3-6D^2+11D-6)y=e^{3x}$ [1]
4. Find the singular points of $xy''+y'+xy=0$ [1]
5. Find the value of $\Gamma\left[\frac{9}{2}\right]$ [1]
6. Prove that div $\left[\frac{\vec{r}}{r^3}\right]=0$. [2]
7. Solve $p=\sin(y-xp)$, where $p=\frac{dy}{dx}$. [2]
8. Find the particular integral of $[D^2+4]y=\cos 2x$ [2]
9. Express $2x^2+x+3$ in terms of Legendre polynomials. [2]
10. Prove $\int x^n J_{n-1}(x)=x^n J_n(x)+c$ [2]

Part - B (5X7=35 marks)

11. a) Calculate the angle between the normals to the surface $xy=z^2$ at the points (4,1,2) and (3,-3,3). [3]

    b) Verify Green`s theorem in the plane for $\oint_C (3x^2-8y^2)dx+(4y-6xy)dy$ where C is the boundary of the region defined by $y=\sqrt{x}$ and $y=x^2$. [4]

12. a) Find the general solution of the differential equation $y'=2xy^2+(1-4x)y+2x-1$. If $y=1$ is a solution of the differential equation. [4]

    b) Find the orthogonal trajectories of hyperbolas $xy=c^2$ [3]

13. a) Solve $(D^2+4)y=e^x+\sin 2x$ [3]

    b) Find the general solution of the equation $y''+y=cosec\ x$ using the method of variation of parameters. [4]

14. a) Derive Rodrigue`s formula. [3]

    b) Show that $nP_n(x)=xP_n'(n)-P_{n-1}'(x)$ [4]

Contd...2

15. a) Show that $\int_0^\infty \frac{y^{q-1}}{(1+y)^{p+q}}dy = \int_0^\infty \frac{x^{p-1}+x^{q-1}}{(1+x)^{p+q}}dx$ [4]

b) Show that $J_{5/2}(x) = \sqrt{\frac{2}{\pi x}}\left(\frac{3-x^2}{x}\sin x - \frac{3}{x}cosx\right)$ [3]

16. a) Using Stroke's theorem evaluate $\oint_c (sin\, z\, dx - \cos x\, dy + \sin y\, dz)$ where 'c' is $0 \le x \le \pi, 0 \le y \le 1, z = 3$ [4]

b) A body originally at 80^0 c cools down to 60^0 c in 20 minutes, the temperature of the air being 40^0 c. What will be the temperature of the body after 40 minutes from the original? [3]

17. Write short notes on any **two** of the following: [7]

a) Complementary function and Particular integrals of a higher order differential equations.

b) Ordinary and singular points and regular singular point of a differential equation.

c) Gamma functions and beta functions.

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