VISVESWARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

MODEL QUESTION PAPER FOR 14MAT21
Second semester B.E. Degree Examination, June.2015
Engineering Mathematics-II

Time: 3 hrs Max marks:100

Answer all the questions selecting any one FULL question from each part

PART-A

1a	Solve $\frac{d^2y}{dx^2} - 4y = cosh(2x-1) + 2^x$	6
b	Solve $(D^2 - 2D + 5)y = e^{2x}sinx$	7
c	Solve $y'' - y' - 2y = x + sinx$ by the method of undetermined coefficient	7

OR

2a	Solve the initial value problem $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6x = 0$ given that $y(0) = 0, \frac{dy}{dx}(0) = 15$	6
b	Solve $D^2y + y = tanx$ by the method of variation of parameters	7
c	Solve $\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} + 6y = e^x + 1$	7

PART-B

3a	Solve $\frac{dx}{dt} - 7x + y = 0$, $\frac{dy}{dt} - 2x - 5y = 0$	6
b	Solve $y\left(\frac{dy}{dx}\right)^2 + (x-y)\frac{dy}{dx} - x = 0$	7
c	Solve $x^2y'' + xy' + y = 2cos^2(logx)$	7

OR

4a	Solve $y = 2px + p^2y$	6
b	Find the general and singular solution of the equation $p = \log(px - y)$	7
c	Solve $(2x-1)^2y'' + (2x-1)y' - 2y = 8x^2 - 2x + 3$	7

PART C

5a	Obtain the partial differential equation by eliminating the arbitrary function given $z = y^2 + 2f\left(\frac{1}{x} + logy\right)$	6
b	Solve $\frac{\partial^2 z}{\partial x \partial y} = sinxsiny$ given $\frac{\partial z}{\partial y} = -2siny$ when $x = 0$ and $z = 0$ when y an odd multiple of $\frac{\pi}{2}$	7
c	Derive one dimensional heat equation $\frac{\partial u}{\partial t} = c^2\frac{\partial^2 u}{\partial x^2}$	7

OR

6a	Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dzdydx$	6
b	Evaluate by changing the order of integration $\int_0^{4a} \int_{x^2/4a}^{2\sqrt{ax}} xy\, dy\, dx$	7
c	find the solution of the wave equation $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ by the method of separation of variables.	7

PART-D

7a	Evaluate $\int_0^2 (4-x^2)^{3/2} dx$ by using Beta and Gamma functions	6
b	Prove that the spherical system is orthogonal.	7
c	Express the vector $\vec{A} = z\hat{i} - 4x\hat{j} + 2y\hat{k}$ in cylindrical coordinates	7

OR

8a	Find the area of an ellipse $\frac{x^2}{a^2} + \frac{y^2}{a^2} = 1$ by double integration.	6
b	Obtain the relation between beta and gamma function in the form $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$	7
c	Obtain an expression for curl in orthogonal curvilinear coordinates.	7

PART-E

9a	Find i) $L\{t^2 e^{-2t} sint\}$ ii) $L\left\{\frac{sin^2 t}{t}\right\}$	6
b	Given $f(t) = \begin{cases} E & 0 < t < a/2 \\ -E & a/2 < t < a \end{cases}$ where $f(t+a) = f(a)$. Show that $L\{f(t)\} = \frac{E}{s} tanh\left(\frac{as}{4}\right)$	7
c	Employ Laplace Transforms to solve the differential equation $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 4y = e^{-x}$ with the initial condition $y(0) = 0, y'(0) = 0$	7

OR

10a	find $L^{-1}\left[\frac{s+5}{s^2-4s+13}\right]$	6
b	Find $L^{-1}\left[\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right]$ by using convolution theorem	7
c	Express $f(t) = \begin{cases} 1 & 0 < t \le 1 \\ t & 1 < t \le 2 \\ t^2 & t > 2 \end{cases}$ in terms of unit step function and hence find its Laplace transforms	7