CBCS Scheme

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15MAT21

Second Semester B.E. Degree Examination, June/July 2016
Engineering Mathematics – II

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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Module-1

1 a. Solve : $(4D^4 - 8D^3 - 7D^2 + 11D + 6)y = 0$. **(05 Marks)**

b. Solve $\dfrac{d^2y}{dx^2} - 4y = \cosh(2x-1) + 3^x$, using inverse differential operator method. **(05 Marks)**

c. Solve : $\dfrac{d^2y}{dx^2} - y = \dfrac{2}{1+e^x}$ by the method of variation of parameters. **(06 Marks)**

OR

2 a. Solve : $\dfrac{d^2y}{dx^2} + 3\dfrac{dy}{dx} + 2y = 1 + 3x + x^2$, using inverse differential operator method. **(05 Marks)**

b. Solve : $\dfrac{d^2y}{dx^2} - 2\dfrac{dy}{dx} + y = e^x \cos x$, using inverse differential operator method. **(05 Marks)**

c. Solve : $\dfrac{d^2y}{dx^2} - 3\dfrac{dy}{dx} + 2y = x^2 + e^x$ by the method of undetermined coefficients. **(06 Marks)**

Module-2

3 a. Solve : $x^2\dfrac{d^2y}{dx^2} - 3x\dfrac{dy}{dx} + 4y = (1+x)^2$ **(06 Marks)**

b. Solve : $y\left(\dfrac{dy}{dx}\right)^2 + (x-y)\dfrac{dy}{dx} - x = 0$. **(05 Marks)**

c. Solve : $y = 2px + p^2y$ by solving for x. **(05 Marks)**

OR

4 a. Solve : $(3x+2)^2 y'' + 3(3x+2)y' - 36y = 8x^2 + 4x + 1$. **(06 Marks)**

b. Solve : $y - 2px = \tan^{-1}(xp^2)$ **(05 Marks)**

c. Solve the equation $(px - y)(py + x) = 2p$ by reducing it into Clairaut's form by taking a substitution $X = x^2$ and $Y = y^2$. **(05 Marks)**

Module-3

5 a. Obtain the partial differential equation by eliminating the arbitrary functions, given that $z = yf(x) + x\phi(y)$ **(05 Marks)**

b. Solve $\dfrac{\partial^2 u}{\partial x \partial y} = \dfrac{x}{y}$ subject to the conditions $\dfrac{\partial z}{\partial x} = \log x$ when $y = 1$ and $z = 0$ when $x = 1$. **(05 Marks)**

c. Derive the one dimensional wave equation in the form, $\dfrac{\partial^2 u}{\partial t^2} = C^2\dfrac{\partial^2 u}{\partial x^2}$ **(06 Marks)**

OR

6 a. Obtain the partial differential equation of the function, $f\left(\frac{xy}{z}, z\right) = 0$. **(05 Marks)**

b. Solve $\frac{\partial^2 z}{\partial x^2} + 3\frac{\partial z}{\partial x} - 4z = 0$, subject to the conditions $z = 1$ and $\frac{\partial z}{\partial x} = y$ when $x = 0$. **(05 Marks)**

c. Derive the one dimensional heat equation in the form $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$. **(06 Marks)**

Module-4

7 a. Evaluate $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} xyz\, dz\, dy\, dx$. **(06 Marks)**

b. Evaluate $\int_0^1 \int_x^{\sqrt{x}} xy\, dy\, dx$ by changing the order of integration. **(05 Marks)**

c. Obtain the relation between beta and gamma function in the form,
$\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. **(05 Marks)**

OR

8 a. Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dx dy$ by changing into polar co-ordinates. **(06 Marks)**

b. Find the area enclosed by the curve $r = a(1+\cos\theta)$ above the initial line. **(05 Marks)**

c. Prove that $\int_0^{\frac{\pi}{2}} \frac{d\theta}{\sqrt{\sin\theta}} \times \int_0^{\frac{\pi}{2}} \sqrt{\sin\theta}\, d\theta = \pi$ **(05 Marks)**

Module-5

9 a. Evaluate : (i) $L\left\{\frac{\cos 2t - \cos 3t}{t}\right\}$ (ii) $L\{t^2 e^{-3t} \sin 2t\}$ **(06 Marks)**

b. If $f(t) = \begin{cases} t, & 0 \le t \le a \\ 2a - t, & a \le t \le 2a \end{cases}$, $f(t+2a) = f(t)$ then show that $L[f(t)] = \frac{1}{s^2}\tanh\left(\frac{as}{2}\right)$. **(05 Marks)**

c. Solve by using Laplace transforms,
$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$, $y(0) = 0$, $y'(0) = 0$ **(05 Marks)**

OR

10 a. Evaluate $L^{-1}\left\{\frac{4s+5}{(s+1)^2(s+2)}\right\}$. **(06 Marks)**

b. Find $L^{-1}\left\{\frac{1}{s(s^2+a^2)}\right\}$ by using convolution theorem. **(05 Marks)**

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 transform. **(05 Marks)**

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