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**Second Semester B.E. Degree Examination, Dec.2018/Jan.2019**  
**Engineering Mathematics – II**

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting at least ONE question from each part.**

Module-1

- 1 a. Solve :  $\frac{d^4y}{dx^4} + a^4y = 0$ . (06 Marks)
- b. Solve :  $(D - 2)^2 y = 8(e^{2x} + \sin 2x + x^2)$ . (07 Marks)
- c. Using the method of variation of parameters solve  $\frac{d^2y}{dx^2} + 4y = \tan 2x$ . (07 Marks)
- 2 a. Solve  $(D^4 + 4D^3 - 5D^2 - 36D - 36)y = 0$ . (06 Marks)
- b. Solve :  $\frac{d^2y}{dx^2} + 4y - x \sin x + \sin 2x$ . (07 Marks)
- c. Solve by the method of undetermined coefficients  $(D^2 - 2D)y = e^x \sin x$ . (07 Marks)

Module-2

- 3 a. Solve :  $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + y = \log x$ . (06 Marks)
- b. Solve :  $P^2 + 2 p y \cot x = y^2$ . (07 Marks)
- c. Find the general and singular solution of the equation  $\sin p x \cos y = \cos p x \sin y + p$ . (07 Marks)
- 4 a. Solve :  $\frac{dx}{dt} - 7x + y = 0$ ,  $\frac{dy}{dt} - 2x - 5y = 0$ . (06 Marks)
- b. Solve :  $(1+x)^2 \frac{d^2y}{dx^2} + (1+x) \frac{dy}{dx} + y = 2 \sin \{ \log(1+x) \}$ . (07 Marks)
- c. Solve :  $y - 2px = \tan^{-1}(x p^2)$ . (07 Marks)

Module-3

- 5 a. Solve :  $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$  for which  $\frac{\partial z}{\partial y} = -2 \sin y$  when  $x = 0$  and  $z = 0$  when  $y$  is an odd multiple of  $\frac{\pi}{2}$ . (06 Marks)
- b. Obtain the solution of one dimensional heat equation  $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$  by the method of separation of variables. (07 Marks)
- c. Evaluate :  $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dz dy dx}{\sqrt{1-x^2-y^2-z^2}}$ . (07 Marks)

- 6 a. Form the partial differential equation by eliminating the arbitrary function form :  $Z = y f(x) + x g(y)$ . (06 Marks)
- b. Solve  $\frac{\partial^2 z}{\partial x^2} = a^2 z$  given that when  $x = 0$ ,  $\frac{\partial z}{\partial x} = a \sin y$  and  $\frac{\partial z}{\partial y} = 0$ . (07 Marks)
- c. Change the order of integration in  $\int_0^{1-x} \int_{x^2}^x x y \, dx \, dy$  and hence evaluate the same. (07 Marks)

**Module-4**

- 7 a. Find the area of the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ , by double integration. (06 Marks)
- b. Prove that  $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ . (07 Marks)
- c. Express the vector  $zi - 2xj + yk$  in cylindrical coordinates. (07 Marks)
- 8 a. Find the volume generated by the revolution of the Cardioid  $r = a(1 + \cos \theta)$  about the initial line. (06 Marks)
- b. Prove that  $\int_0^{\pi/2} \sqrt{\sin \theta} \, d\theta \times \int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin \theta}} = \pi$  (07 Marks)
- c. Prove that Spherical polar coordinate system is orthogonal. (07 Marks)

**Module-5**

- 9 a. Find  $L\left\{e^{-t} \frac{\sin t}{t}\right\}$ . (06 Marks)
- b. Draw the graph of the periodic function :  $f(t) = \begin{cases} t, & 0 < t < \pi \\ \pi - t, & \pi < t < 2\pi \end{cases}$ .  
Where  $f(t + 2\pi) = f(t)$  find  $L\{f(t)\}$ . (07 Marks)
- c. Using convolution theorem, evaluate  $L^{-1}\left\{\frac{s}{(s^2 + a^2)^2}\right\}$ . (07 Marks)
- 10 a. Find :  $L\left\{\left(\sqrt{t} - \frac{1}{\sqrt{t}}\right)^3\right\}$ . (06 Marks)
- b. Express  $f(t) = \begin{cases} \sin t, & 0 < t \leq \frac{\pi}{2} \\ \cos t, & t > \frac{\pi}{2} \end{cases}$   
interms of unit step function and hence find  $L\{f(t)\}$ . (07 Marks)
- c. Solve :  $y''' + 2y'' - y' - 2y = 0$ , using Laplace transforming with  $y(0) = y'(0) = 0$ ,  $y''(0) = 6$ . (07 Marks)

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