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Total No. of Questions : 6 Total No. of Printed Pages : 4

EIS-177

B.E. (IInd Sem.) (CGPA) (Civil Engg.) Exam.-2015

ENGINEERING MATHEMATICS-II

Paper : CE-201

Time Allowed : Three Hours
Maximum Marks : 60

Note : Attempt all questions.
Question No. I is compulsory.

Q.I Give the answer to the following questions—

(a) Find the integrating factor of the differential equation $\left(1+y^2\right)+\left(x-e^{-\tan^{-1}y}\right)\frac{dy}{dx}=0$

(b) Complementary function of $\left(D^4-1\right)y=x^2$ is ..... .

(c) If $y=x$ is a part of C.F. of the equation $\frac{d^2y}{dx^2}+P\frac{dy}{dx}+Qy=R$ if ..... .

(d) Inverse Laplace transform of $\frac{S}{s^2-a^2}$ is .....

(e) The constant term in the Fourier series for the function $f(x)=x^2$ in the interval $(-\pi, \pi)$ is .....

Q.II (a) Solve—

$$(3x^2y^4+2xy)dx+(2x^3y^3-x^2)dy=0$$ 149

(b) Solve—

$$y-x=x\frac{dy}{dx}+\left(\frac{dy}{dx}\right)^2$$ 198

or

(a) Solve —

$$p=\tan\left(x-\frac{p}{1+p^2}\right)$$ 680

(b) Solve the differential equation—

$$\frac{dy}{dx}-\frac{\tan y}{1+x}=(1+x)e^x\sec y$$ 146

Q.III (a) Solve the differential equation —

$$\frac{d^2y}{dx^2}-5\frac{dy}{dx}+6y=\sin 3x+4e^{-2x}$$

(b) Solve—

$$x^2\frac{d^2y}{dx^2}+2x\frac{dy}{dx}-20y=(x+1)^2$$

or

(a) Solve—

$$(2+3x)^2\frac{d^2y}{dx^2}+3(2+3x)\frac{dy}{dx}-36\,y=5x^2$$

(b) Solve the Simultaneous equations—

$$\frac{dx}{dy}+2x-3y=t;$$

$$\frac{dy}{dt}-3x+2y=e^{2t}$$

Q.IV (a) Solve— $x\frac{d^2y}{dx^2}-\frac{dy}{dx}-4x^3y=8x^3\sin x^2$

(b) Prove that— $J_{-1/2}(x)=\sqrt{\frac{2}{\pi x}}\cos x$

or

(a) Apply the method of variation of parameters to solve $\frac{d^2y}{dx^2}-3\frac{dy}{dx}+2y=\frac{e^x}{1+e^x}$.

(b) Solve in series— $(2-x^2)\frac{d^2y}{dx^2}+2x\frac{dy}{dx}-2y=0$

Q.V (a) Find $L\left\{\frac{e^{-at}-e^{-bt}}{t}\right\}$.

(b) Use Laplace transform method to solve—

$$\frac{d^2x}{dt^2}-2\frac{dx}{dt}+x=e^t \text{ with } x=2, \frac{dx}{dt}=-1 \text{ at } t=0$$

or

(a) If $f(t)$ be a periodic function with period T i.e. $f(t)=f(t+nT)$, then prove that

$$L\{f(t)\}=\frac{1}{1-e^{-ST}}\int_0^T e^{-St} f(t)dt.$$

(b) Find the inverse L.T. of—

(i) $L^{-1}\left\{\frac{1}{s^2-6s+18}\right\}$ (ii) $L^{-1}\left\{\log\frac{s+1}{s+2}\right\}$

Q.VI (a) Develop $\sin\left(\frac{\pi x}{l}\right)$ in a half range cosine series in the range $0<x<l$.

(b) Solve the partial diff. equation—

$$\frac{\partial^2 z}{\partial x^2}-\frac{\partial^2 z}{\partial x \partial y}=2\sin x \cos 2y$$

or

(a) Find the Fourier series for the function

$$f(x)=x-x^2, -\pi \le x \le \pi$$

(b) Solve the p.d.e. $\left(x^2-yz\right)p+\left(y^2-zx\right)q=z^2-xy$.