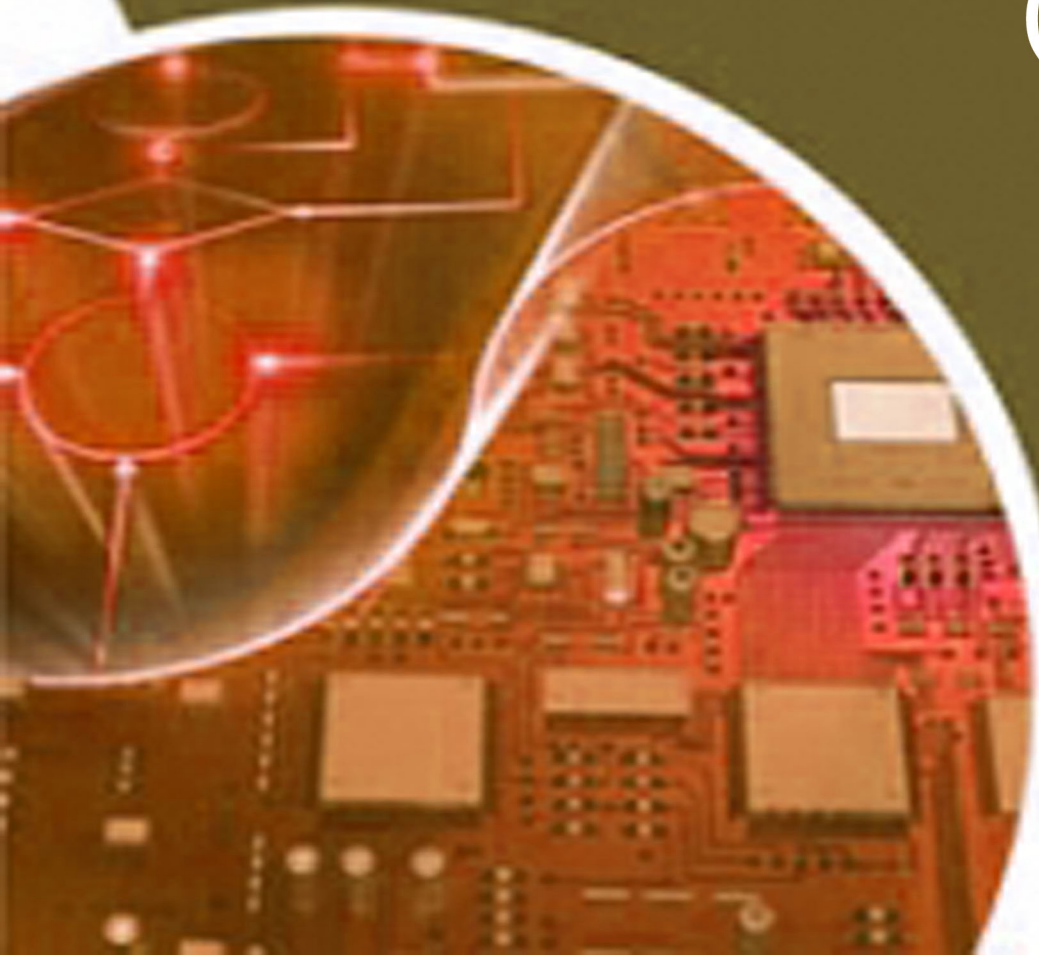
RGPV
3rd & 4th Semester
QUESTION PAPERS

Bachelor of Engineering

Mechanical Engineering
(2009-2014)



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Total No. of Questions : 10] [Total No. of Printed Pages : 4

Roll No. ...0502EX101007.....

BE–301(GS)

B. E. (Third Semester) EXAMINATION, Dec., 2011

(Grading System)

(Common for all Branches)

ENGINEERING MATHEMATICS – II

[BE – 301(GS)]

Time : Three Hours

Maximum Marks : 70

Minimum Pass Marks : 22 (Grade-D)

Note : Attempt *one* question from each Unit. All questions carry equal marks.

Unit – I

1. (a) Find the Fourier transform for the function :

$$f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$$

(b) Find the Fourier transform of :

$$f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$$

Or

2. (a) Express $f(x) = x$ as a half range cosine series in $0 < x < 2$.

(b) Find the Fourier sine transform of $e^{-|x|}$. Hence, show that :

$$\int_0^\infty \frac{x \sin mx}{1 + x^2} dx = \frac{\pi e^{-m}}{2}, m > 0$$

P. T. O.

Unit – II

3. (a) If $f(t)$ is a periodic function with period T, then prove that :

$$L\{f(t)\} = \frac{\int_0^T e^{-sT} f(t)\, dt}{1 - e^{-sT}}$$

(b) Apply Convolution theorem to evaluate :

$$L^{-1}\left(\frac{s}{(s^2 + a^2)^2}\right)$$

Or

4. (a) Find the Laplace transforms of :

(i) $\frac{1 - e^t}{t}$

(ii) $t^2 \sin at$

(b) Solve the equation $\frac{d^2 y}{d t^2} - 3\frac{dy}{dt} + 2y = 4e^{2t}$, $y(0) = -3$, $y'(0) = 5$ using Laplace transform.

Unit – III

5. (a) Solve the equation :

$$(1 - x^2)\frac{d^2 y}{d x^2} - 2x\frac{dy}{dx} + 2y = 0$$

given that $y = x$ is a solution.

(b) Solve the Bessel's equation :

$$x^2 \frac{d^2 y}{d x^2} + x\frac{dy}{dx} + (x^2 - n^2)y = 0$$

Or

6. (a) Solve the equation :

$$\frac{d^2 y}{d x^2} + \cot x \frac{dy}{dx} + 4y \operatorname{cosec}^2 x = 0$$

(b) Find the series solution of the equation :

$$x\frac{d^2y}{dx^2}+\frac{dy}{dx}+xy=0$$

Unit – IV

7. (a) Solve the equations :

(i) $\frac{y^2z}{x}p+xz\,q=y^2$

(ii) $x^2p^2+y^2q^2=z^2$

(b) Solve the equation :

$$\frac{\partial^2 z}{\partial x^2}-4\frac{\partial^2 z}{\partial x\,\partial y}+4\frac{\partial^2 z}{\partial y^2}=e^{2x+y}$$

Or

8. Solve the wave equation :

$$\frac{\partial^2 y}{\partial t^2}=c^2\frac{\partial^2 y}{\partial \pi^2}$$

subject to the conditions :

$y(0,t)=0,\quad y(l,t)=0;\quad y(x,0)=a\sin\left(\frac{\pi x}{\lambda}\right)$ and $\left(\frac{\partial y}{\partial t}\right)_{t=0}=0.$

Unit – V

9. (a) Prove that :

(i) $\nabla r^n=n\,r^{n-2}\vec{r}$, where $\vec{r}=x\hat{i}+y\hat{j}+z\hat{k}$.

(ii) Curl $\vec{F}=0$, where $\vec{F}=\text{grad}\,(x^3+y^3+z^3-3\,xyz)$.

(b) (i) Find a unit vector normal to the surface $xy^3z^2=4$ at the point $(-1,-1,2)$.

(ii) Show that the vector :

$$\vec{A} = (-x^2 + yz)\hat{i} + (4y + z^2 x)\hat{j} + (2xz - 4z)\hat{k}$$

is solenoidal.

Or

10. (a) Use Stokes' theorem to evaluate :

$$\int_C [(x + y)\, dx + (2x - z)\, dy + (y + z)\, dz]$$

where C is the boundary of the triangle with vertices (2, 0, 0), (0, 3, 0) and (0, 0, 6).

(b) Evaluate :

$$\int_S \vec{F} \cdot dS$$

where $\vec{F} = 4x\hat{i} - 2y^2\hat{j} + z^2\hat{k}$ and S is the surface bounding the region $x^2 + y^2 = 4$, $z = 0$ and $z = 3$.

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BE - 301

B.E. III Semester

Examination, December 2014

Mathematics - II

(Common for all Branches)

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a) Write the Euler's formula to find Fourier series?

b) Define Fourier transform and give the shifting property for Fourier transform?

c) Find the Fourier sine transform of

$$f(x)=\begin{cases}\sin x & ,0<x<a\\ 0 & ,x>a\end{cases}$$

d) Find the Fourier series for the periodic function $f(x)$ defined by

$$f(x)=\begin{cases} -\pi & when \quad -\pi<x<0 \\ x & when \quad 0<x<\pi \end{cases}$$

OR

Find a half range cosine series for

$$f(x)=\begin{cases} kx & , \ 0\le x\le l/2 \\ k(l-x) & , \ l/2\le x\le l \end{cases}$$

Unit - II

2. a) Find $L\left\{3t^4-2t^3+4e^{-3t}-2\sin 5t+3\cos 2t\right\}$.

b) Explain first shifting property of Laplace transform.

c) Evaluate $L\left\{\int_0^t \frac{\sin t}{t}\,dt\right\}$

d) Find $L^{-1}\left\{\frac{(2s+1)}{(s-1)^2(s+2)^2}\right\}$

OR

Using convolution theorem evaluate

$$L^{-1}\left\{\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right\}$$

Unit - III

3. a) Write the conditions for series solution of differential equation?

b) Explain the regular and irregular singular points?

c) Solve $\frac{d^2y}{dx^2}-\cot x\left(\frac{dy}{dx}\right)-(1-\cos x)y=e^x\sin x$

d) Solve $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}-y=0$ given that $\left(x+\frac{1}{x}\right)$ is one integral.

OR

Solve $\left(2x+x^3\right)\frac{d^2y}{dx^2}-\frac{dy}{dx}-6xy=0$

Unit - IV

4. a) Solve $p\tan x+q\tan y=\tan z$

b) Solve $\left(y^2+z^2-x^2\right)p-2xyq+2zx=0$

c) Form the partial differential equation from the following relation $Z=f(x+iy)+F(x-iy)$

Where f and F are arbitrary functions.

d) Solve by Charpit's method

$px+qy=pq$

OR

Solve $pt-qs=q^3$

Unit - V

5. a) If $r = xi + yj + zk$

Then show that grad $r = \hat{r}$

b) Find a unit normal vector normal to the surface $\phi = x^2 + y^2 - z$ at the point (1, 2, 5)

c) If vector $F = (x+3y)i + (y-2z)j + (x+9z)k$ is a solenoidal vector, then find the value of a?

d) Evaluate $\int_C F.dr$ where $F = e^x \sin y\, i + e^x \cos y\, j$ and the vertices of rectangle C are (0, 0) (1, 0) (1, π/2) (0, π/2)

OR

Evaluate $\iint_S A.\hat{n}\, ds$ where A = $18zi - 12j + 3yk$ and S is the part of the plane $2x + 3y + 6z = 12$.

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BE - 301

B.E. III Semester

Examination, June 2014

Engineering Mathematics - II

(Common for all Branches)

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and drawing etc.

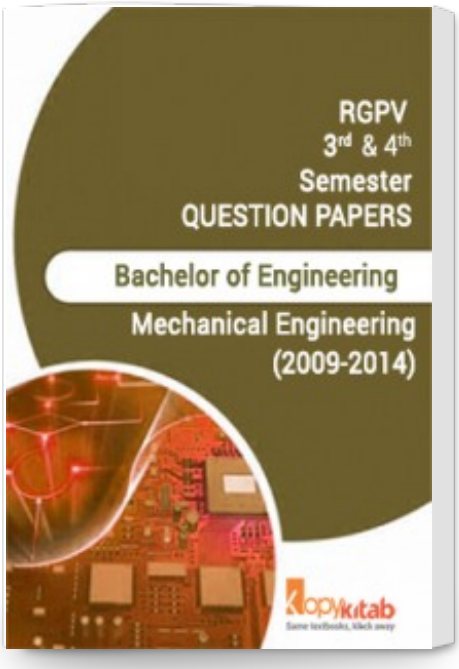
1. a) Write Dirichlet's conditions for Fourier series.

b) Write linear property and change of scale property four Fourier transform.

c) Find the Fourier sine transform of $e^{-|x|}$.Hence show that

$$\int_0^\infty \frac{x \sin mx}{1+x^2} dx = \frac{\pi e^{-m}}{2}, m>0$$

RGPV QUESTION PAPERS 2nd Year Mechanical Engineering (2009-2014)



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