Total No. of Printed Pages:2

SUBJECT CODE NO: H-490
FACULTY OF SCIENCE AND TECHNOLOGY
F.E. (All)
Engineering Chemistry & Environmental Sci.
(REVISED)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B i) Question No.1 & Question No.6 are compulsory.
ii) Solve any two questions from the remaining questions of each section – A & section – B.
iii) Figures to the right indicate full marks.

Section A

Q.1 Answer the following question. (any five) 10

1) What are the disadvantages of Natural rubber?
2) PVC is soft & flexible whereas Bakelite is hard & brittle. Give reason.
3) Write advantages of lubricants.
4) What will happen if Gypsum is not added during grinding of clinkers?
5) Why hardness due to $Ca(HCO_3)_2$ & $Mg(HCO_3)_2$ is temporary hardness?
6) Define Reverse osmosis.
7) Write advantages of Ion-exchange process.
8) Write composition of cement.

Q.2 a) Define Polymer? How they are classified? Write mechanism of addition polymerisation. 07
b) Distinguish between thermosoft & thermosetting polymer. 04
c) Write note on polymers in medicine & surgery. 04

Q.3 a) Define Abrasives? How they are classified? Write their advantages. 07
b) Write the different physical factors influencing the adhesive strength. 04
c) Write chemical composition of Portland cement. 04

Q.4 a) Describe with diagram principle advantages & limitations of Zeolite process of softening of hard water. 07
b) Write Applications of Conductometer. 04
c) Write the difference between scale & sludge in boiler. 04

Q.5 a) Describe the method of preparation properties & applications of Bakelite? 07
b) Explain purification of water by Electro dialysis method. 04
c) Write advantages & disadvantages of Ion exchange water purification method. 04

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Section B

Q.6 Answer the following. (any five) 10

1) Why are galvanized utensils are not used.
2) Define Gross & Net calorific value of fuel.
3) Write Applications of lubricants.
4) How photochemical smog formed?
5) Write the Name of Green-house gases.
6) What are causes of soil pollution?
7) What is Lead-acid accumulator?
8) What are types of coal?
9) Write the names of Radioactive pollutants.

Q.7
a) What is corrosion of metal? Describe the mechanism of electrochemical corrosion by evolution of Hydrogen & absorption of oxygen. 07
b) Define lubrication. Write the classification of lubricants with example. 04
c) Write the factors affecting on rate of corrosion. 04

Q.8
a) What are characteristics of Good fuel? Explain proximate analysis of coal sample. 07
b) Write note on Flash & Fire point of lubricants. 04
c) Outline the construction & working of Nicket cadmium battery. 04

Q.9
a) Define the term pollution & pollutants. Describe in detail segments of Environment. 07
b) Discuss briefly “Radioactive Pollution”. 04
c) What are disadvantages of Global warming? 04

Q.10
a) With a neat labelled diagram describe the fractional distillation of petroleum. List different fractions by distillation of Crude oil. 07
b) What are common air pollutants & their sources? 04
c) Define 04
   1) Viscosity
   2) Fire point
   3) Acid value
   4) Viscosity Index

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Total No. of Printed Pages:3

SUBJECT CODE NO:- H-485
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Engineering Physics
(REVISED)

[Time: Three Hours] **[Max.Marks: 80]**

Please check whether you have got the right question paper.

N.B
1. Attempt Q.No.1 from section A and Q.No.6 from section B are compulsory.
2. Solve any two questions from the remaining questions from each section A and B.
3. Figures to the right indicate full marks.
4. Use of non-programmable calculator is allowed.

Section A

Q.1 Attempt any five questions from the following. 10

a) Define Canal rays.
b) Distinguish between characteristic and continuous spectra.
c) Write the engineering application of interference.
d) What is mean by resolving power of diffraction grating?
e) Define the term specific rotation.
f) Write the application of superconductor.
g) Write the properties of ferromagnetic materials.
h) What is mean by Compton Effect?

Q.2 a) Describe working of CRT with neat labeled diagram. 06

b) Deduce the expression of Compton shift in the form of frequency. 06

c) Electron is accelerated by a potential of 500 V enter the electric field at an angle of incidence 60^0 and makes an angle of 45^0 while entering in another region. Find the potential difference between two fields. 03

Q.3 a) Prove that for Newton's rings in reflected light the diameters of dark rings are proportional to the square root of natural numbers and the diameters of bright rings are proportional to the square roots of odd integers. 06

b) Explain the theory of plane diffraction grating. Obtain the condition for maxima and minima of the diffraction pattern. 06

c) Calculate thickness of mica plate required to make a quarter wave plate and half wave plate for light of wavelength5890 A^0. Given $\mu_o = 1.586$ *and* $\mu_e = 1.592$ 03

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Q.4 a) Write the silent feature of BCS theory. 05

b) State and explain Meissner effect. 05

c) What are ferromagnetic materials? Explain the important properties of ferromagnetic materials. 05

Q.5 Write a short notes on: 15

a) Hysteresis Loop
b) Aston mass spectrograph
c) Michelson's interferometer

Section B

Q.6 Attempt any five questions from the following. 10

a) Write the expression of Fermi-Dirac distribution function.
b) What is mean by Raman Effect?

c) Define:-
   i. Acceptance cone
   ii. Numerical aperture

d) Write the importance of Hall Effect.
e) What do you mean by lasers? Define spontaneous and stimulated emission.
f) Write the properties of Ultrasonic waves.
g) Define the terms absorption coefficient and echo.
h) How is the Nanotechnology used in textile?

Q.7 a) What is mean by forbidden gap? Deduce the expression for Fermi level in intrinsic semiconductor. 06

b) Derive Schrodinger time base wave equation. 05

c) State and explain Raman Effect. 04

Q.8 a) Explain the construction and working of solid state laser. Write its drawbacks. 06

b) Write the frequency range of ultrasonic waves? Explain any one method of production of ultrasonic waves. 05

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c) Typical an optical fiber and its cladding have refractive indices of 1.5 and 1.4 respectively find out 04
   i. Numerical aperture
   ii. Acceptance angle and
   iii. Critical angle

Q.9 a) Describe sol-gel method for synthesis of nanoparticles. 05

b) Write any 3 of each mechanical and electrical application of CNT. 05

c) Describe the use of nanotechnology in cosmetics and agriculture. 05

Q.10 Write a short notes on: 15

a) Explain the important any 2 applications of CNT's
b) Pumping mechanism
c) Fermi-Dirac distribution function.

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Total No. of Printed Pages:2

SUBJECT CODE NO: H-156
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Basic Mechanical Engineering
(REVISED)

[Time: Three Hours] **[Max.Marks: 80]**

Please check whether you have got the right question paper.

N.B
i) Q. No. 1 and Q. No.6 are compulsory
ii) Attempt any two questions from the remaining questions in each section 'A' and 'B'
iii) Assume suitable data if necessary and mentioned it clearly
iv) Figure to right indicate full marks
v) Use of non-programmable calculator in allowed

Section A

Q.1 Solve any five 10
a) Define Boyle's law and Charles's law of an ideal gas
b) Define thermodynamic equilibrium and write any one example of it.
c) Show constant volume process of PV and TS diagram
d) Differentiate between point and path function
e) Write any four applications of refrigeration system
f) Write the classification of an automobile system
g) State the sign conventions for heat and work
h) State Joule's law of thermodynamics and write any one example of it.

Q.2 a) Differentiate between heat and work 07
b) State law of conservation of energy. Explain Joule's experiment with neat diagram 08

Q.3 a) Derive equation of state for an ideal gas 08
b) A mass of 0.8 kg of air at 1 bar and 25°C is contained in a gas tight frictionless piston-cylinder device. The air is now compressed to final pressure of 5 bar. During the process, heat is transferred from the air such that the temperature inside the cylinder remains constant. Calculate the heat transfer and work done during the process and direction of each in the process. 07

Q.4 a) Explain with neat diagram the construction and working principle of four stroke SI engine. 08
b) Define refrigeration system. Explain with neat diagram the working principle of household refrigerator. 07

Q.5 a) Write short note on different modes of heat transfer with suitable example 08
b) Write the applications of compressed air 07

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Section B

Q.6 Solve any five 10

a) State the various power transmitting elements
b) Define forging operation
c) Enlist any four applications of cast iron material
d) State the working principle of Drilling machine
e) Define Arbor in milling machine
f) How shaft is differ from Axle
g) Define addendum and dedendum of gear
h) Define clutch and write any two applications of it.

Q.7 a) Explain the construction and working of multi-plate clutch with neat diagram. 07

b) In assembly of spur gear having velocity ratio 0.2, the centre distance between gears is 500 mm and module is 5mm. find 08

1) No. of teeth on pinion
2) No. of teeth on gear
3) Pitch circle diameter of pinion
4) Pitch circle diameter of gear

Q.8 a) Explain in detail selection criteria of engineering materials 07

b) Write detail classification of forging process and explain with neat sketch drop forging operation 08

Q.9 a) Draw the block diagram of centre Lathe machine and explain its principle parts. 08

b) Explain with neat sketch the working of Radial Drilling machine 07

Q.10 a) Write short note on annealing and normalizing heat treatments. 07

b) List the operations performed on grinding machine and explain the same with neat sketch. 08

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Total No. of Printed Pages:2

SUBJECT CODE NO: H-155
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Elements of Mechanical Engineering
(OLD)

[Time: Two Hours] **[Max.Marks: 40]**

Please check whether you have got the right question paper.

N.B
1) Question No.1 is Compulsory.
2) Attempt any two questions from the remaining.
3) Assume suitable data wherever necessary.
4) Figure to right indicates Full marks.
5) Use of non-programmable calculators is allowed.

Q.1 Solve any Five of the following. 10
a) Explain the Zeroth law of thermodynamics.
b) State the function of spark Plug and carburetor.
c) State and explain Charle's law.
d) State any Four advantage of Nuclear energy.
e) Define modes of heat transfer.
f) Define working substance and name any two.
g) Represent Isothermal process on PV and TS diagram.
h) Differentiate between process and cycle.

Q.2 a) State different types of thermodynamic systems. Explain in brief open system. 07

b) 1Kg of gas is kept to a constant volume tank. Initial pressure and volume are 4bar and $0.21m^3$ 08
respectively. When a heat energy of 82KJ is supplied to the system, the final temperature of the gas becomes 127^0C. Find
1) Workdone
2) Change in internal energy
3) Specific heat at constant volume. Take R=300Nm/kgK.

Q.3 a) Differentiate between SI and CI engine. 07

b) Explain with block diagram the working principle and applications of Air conditioner. 08

Q.4 a) Explain with suitable diagram the working principle of Nuclear Power Plant. Write any two application of it. 08

b) Write the types of steam turbine. Explain in brief working of Reaction turbine. 07

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Q.5 Write short note on[Any 03] 15

a) CRDI system
b) pdv Work
c) Polytropic Process
d) Application of compressed air

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H-122

Total No. of Printed Pages:04

SUBJECT CODE NO: H-122
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Engineering Mechanics
(REVISED)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
i) Question numbers one & six are compulsory.
ii) Attempt any two questions from each section from remaining.
iii) Figures to the right indicate full marks.
iv) Assume suitable data if necessary.

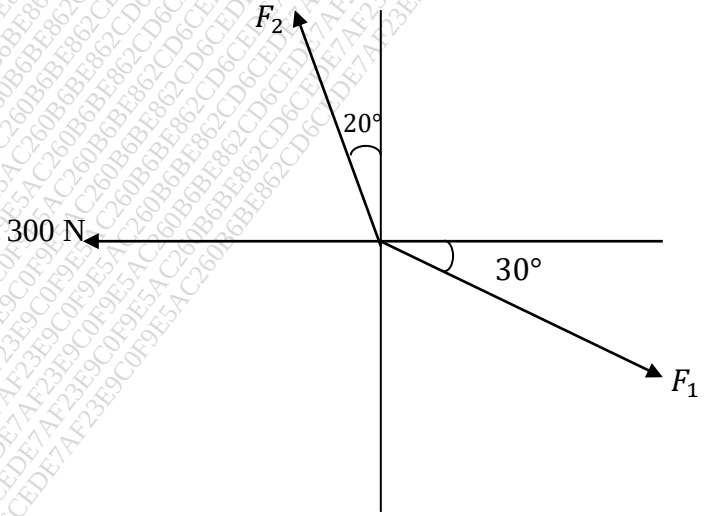
SECTION – A

Q.1 Attempt any FIVE from the following. 10

a) State the principle of transmissibility of forces.
b) State Lami's theorem.
c) Define the term free body diagram
d) Define coefficient of friction.
e) Define the term friction.
f) What are the assumptions made in the analysis of simple truss.
g) Enlist the different type of support.
h) What do you mean by resolution of force?

Q.2 a) The resultant of the two forces, whey they act at an angle of 60° is 14 N. if the same forces are acting at right angles, their resultant is $\sqrt{136}$ N. Determine the magnitude of the two forces. 07

b) Determine the magnitude of F_1 and F_2 so that the particle is in equilibrium. 08



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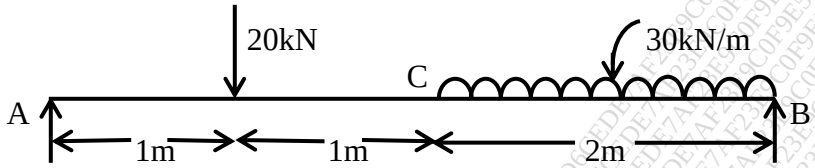
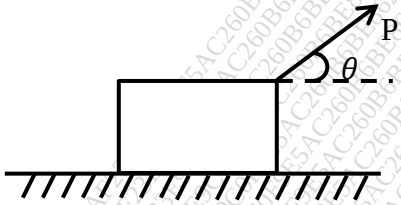
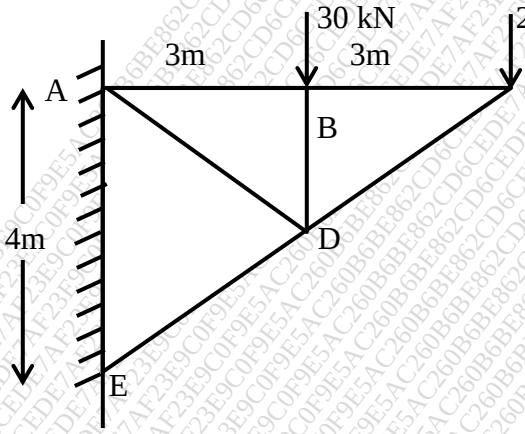
Q.3 a) Find the support reactions for the beam shown in fig. by virtual work method. 07



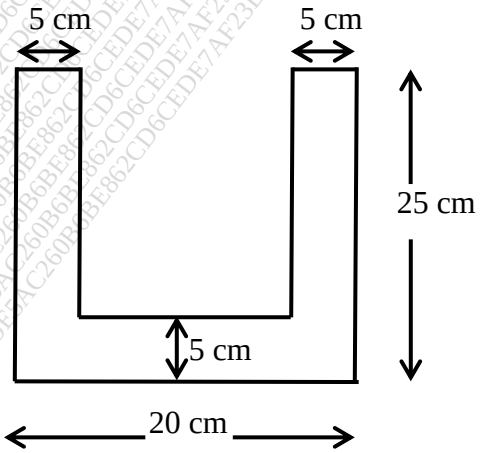
b) Find the minimum force P required to move the block A weighing 20 kN. If $\mu = 0.25$. Find θ also. 08



Q.4 Determine the forces in each member of the truss & state if the members are in tension OR compression. 15



Q.5 Determine moment of inertia of the area about its centroidal axes. Also determine centroidal polar moment of inertia. 15



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SECTION – B

Q.6 Attempt any FIVE questions from the following. 10

a) Define the term range of projectile.
b) State law of conservation of momentum.
c) Define the term Angular acceleration.
d) State D' Alembert's principle.
e) Define the coefficient of restitution.
f) Find the power of an engine, which can do a work of 1200 joules in 8 seconds.
g) Distinguish clearly between mass & weight.
h) Define momentum.

Q.7 a) A body is moving with uniform acceleration and covers 20m in 4^{th} sec. and 30 m in 8^{th} second. Determine 07

i) The initial velocity of the body.
ii) Acceleration of the body.

b) A particle moves along a straight line so that it's displacement in Meter from a fixed point is given by, 08

$s = 2t^3 + 4t^2 - 6t + 8$

Find :-

i) Velocity at start
ii) Velocity after 5 second
iii) Acceleration at start
iv) Acceleration after 5 seconds.

Q.8 a) A particle is projected in air with a uniform velocity 60 m/s at an angle of 45° with the horizontal. 07

Find :-

i) horizontal range
ii) maximum height attained by particle
iii) time of flight

b) A wheel, rotating about a fixed axis at 20 r.p.m, is uniformly accelerated for 70 seconds, during which time it makes 50 revolution. 08

Find:-

i) Angular velocity at the end of this interval and
ii) Time required for the speed to reach 100 revolution per minute.

Q.9 a) Two bodies of weight 30 N and 15 N are connected to the two ends of a light in extensible string, passing over smooth pulley. The weight of 30 N is placed on a smooth horizontal surface while the weight of 15 N is hanging free in air. 07

Find:-

i) The acceleration of the system
ii) The tension in the string take $g = 9.81\ m/s^2$

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b) A bullet of mass 50 gm is fired into a freely suspended target to mass 5 kg. on impact, the target moves with a velocity of 7 m/s along with the bullet in the direction of firing. Find the velocity of bullet. 08

Q.10 a) A block of wood of weight 1000 N is placed on a smooth inclined plane which makes an angle of 30° with the horizontal. Find the work done in pulling the block up for a length of 5m. 07

b) Find the angular acceleration of flywheel of an engine, which weighs 1500 N and has a radius of gyration 0.6m, if the wheel is subjected to a torque of $2000\ N.m$ Take $g = 9.8\ m/s^2$. 08

Total No. of Printed Pages:03

SUBJECT CODE NO: H-121
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Engineering Mechanics
(OLD)

[Time: Two Hours] **[Max.Marks: 40]**

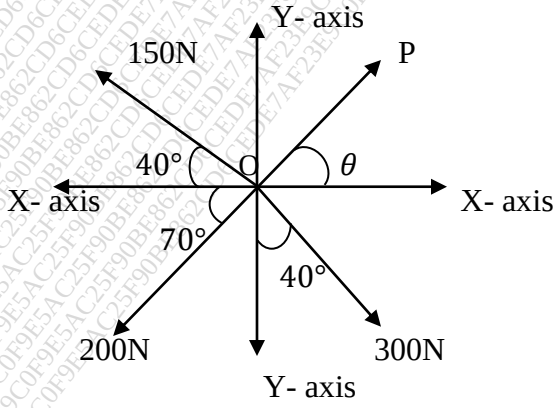
Please check whether you have got the right question paper.

N.B
1) Question number 1 is compulsory.
2) Solve any two questions from the remaining.
3) Figures to the right indicate full marks.
4) Assume suitable data if required.

Q.1 Explain the following terms. (Any five) 10

i) Define couple and moment of force.
ii) Define free body diagram.
iii) State the Varignon's theorem.
iv) Define the force and give its unit in S.I system.
v) State principle of equilibrium and force law of equilibrium.
vi) State Lami's theorem
vii) Define angle of friction.
viii) Define the centre of gravity.
ix) Define the term 'Friction'.
x) Define the Angle of repose.

Q.2 a) Four forces of magnitude P, 150N, 200 N and 300 N are acting at a point as shown in figure. Determine the magnitude and direction of force 'P'. Sum of that force system is in equilibrium. 08



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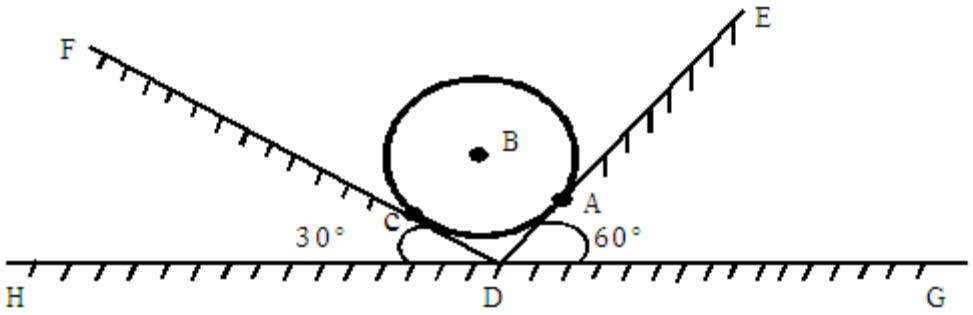
b) A ball of weight 120 N rests in a right angle groove as shown in figure. The sides of groove are inclined to an angle of 30° and 60° to the horizontal. If all the surfaces are smooth, then determine the reactions at the point of contact $(R_A \ \& \ R_C)$. 07

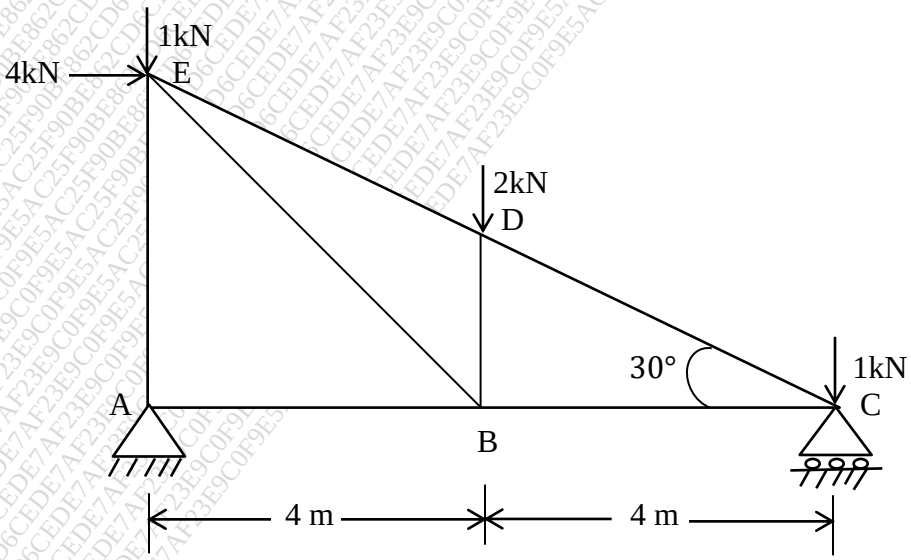


Q.3 a) State the terms Virtual work and Virtual displacement? 04

b) State the principle of virtual work and its applications. 04

c) A uniform ladder of 8M rests against a vertical wall with which it makes angle of 45°. The coefficient of friction between the ladder and the wall is 1/3 and that between ladder and floor is 1/2. If a man whose weight is one half of that ladder, ascends its, how high will it be when the ladder slips. 07

Q.4 a) Determine the forces in all the members of truss as shown in figure. Indicate the nature of forces. 09



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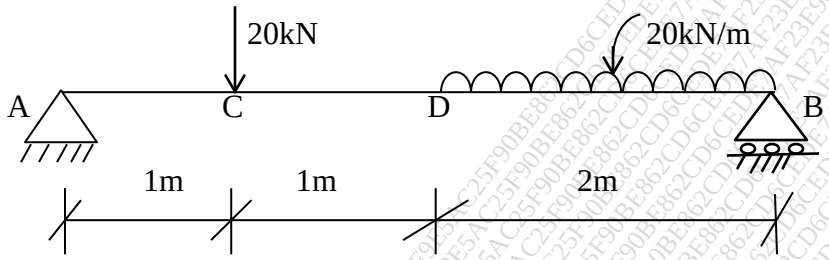
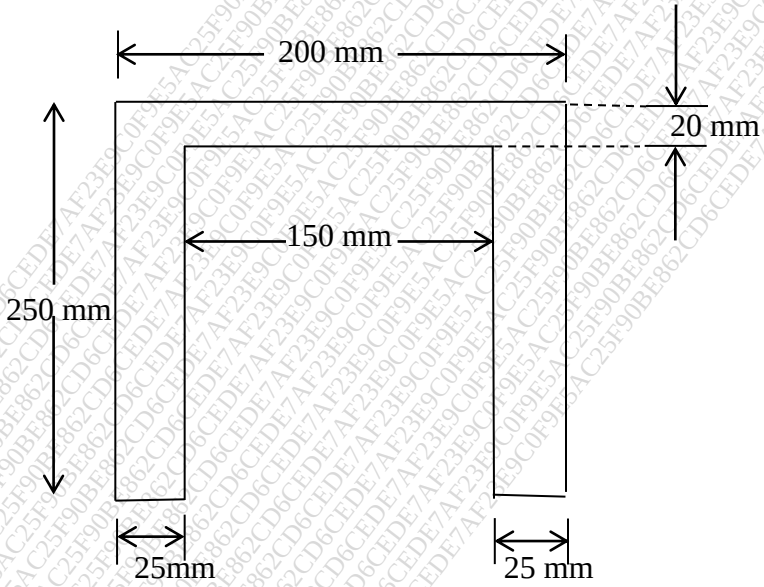
b) Determine the reaction at support A and B of the beam loaded as shown in figure. Use principle of virtual work method. 06



Q.5 a) Show that the moment of inertia of rectangular section about X – X axis passing through centre of gravity of section is $\frac{bd^3}{12}$. 06

b) Find the moment of inertia for the following section about X –X axis as shown in figure. 09



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Total No. of Printed Pages:2

SUBJECT CODE NO: H -192
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Basic Electronics Engineering
(REVISED)

[Time: Two Hours] **[Max.Marks:40]**

Please check whether you have got the right question paper.

N.B
i. Q. No. 1 is compulsory.
ii. Solve any two questions from remaining questions.
iii. Assume suitable data whatever necessary.

Q.1 Solve any five. 10

a) Write 2'S complement of 110101.
b) Draw the symbol & truth table of AND & OR gate.
c) Draw the circuit diagram of bridge rectifier.
d) Enlist types of rectifier.
e) Draw the symbol of MOSFET & DIAC.
f) Write the colour code of the following.
   i) 37Ω , $\pm 5\%$
   ii) 100Ω , $\pm 20\%$
g) Enlist the applications of TRIAC.
h) Define holding current & break over voltage of SCR.

Q.2 a) Enlist MOSFET with their construction, working & principal. 08

b) Draw & explain the V –I characteristics of PN junction diode. 07

Q.3 a) Define voltage regulator. Explain three terminal voltage regulator using IC 79XX. 07

b) Explain Zener diode as voltage regulator. 08

Q.4 a) Perform the following operation 07
   a. $(100101)_2 - (10101)_2$
   b. $(26)_8 - (10)_8$

b) Perform the following conversion 08
i. $(421)_8 = (\ )_{10} = (\ )_{16}$
ii. $(10011)_{16} = (\ )_2 = (\ )_{10}$

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Q.5 Write short note on (<u>any three</u>) 15

a) NPN transistor
b) JFET
c) Adjustable voltage regulator using LM 317
d) Universal gate
e) DE – MORGANs theorem.

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Total No. of Printed Pages:4

SUBJECT CODE NO:- H-101
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Engineering Mathematics-II
(OLD)

[Time: Three Hours] **[Max.Marks: 80]**

Please check whether you have got the right question paper.

N.B
1. Q.No.1 and 6 are compulsory.
2. Attempt any two questions from remaining four questions from each section.
3. Figures to the right indicate full marks.
4. Assume suitable data, if necessary.

Section A

Q.1 Attempt any five from the following. 10

a) Prove that $\beta(m,n) = \beta(m,n+1) + \beta(m+1,n)$.

b) Evaluate $\int_0^{\pi/2} \sin^{10} x \, dx$

c) Evaluate $\int_0^1 \int_0^1 \int_0^1 xyz \, dxdydz$

d) Change the order of integration of $\int_0^1 \int_0^x f(x,y) dxdy$

e) Evaluate $\int_0^{\pi/2} \sin^8 x . \cos^{10} x \, dx$

f) The mean value of the function $y = f(x)$ from $x = a \; to \; x = b$ is ----------.

g) Find the volume of the solid generated by the curve $y = \sin x$ between the $x = 0 \; and \; x = \pi$

h) The surface area of solid formed the revolution of the curve $y = f(x)$ about x-axis from $x = a \; to \; x = b$

Q.2 a) Evaluate $\int_0^2 x^3 \sqrt{2-x} \; dx$ 05

b) Evaluate $\int\int e^{ax+by} \, dxdy$, over the triangle bounded by $x = 0, y = 0, ax + by = 1$ 05

c) Find the surface of the solid generated by revolution of the loop of the curve $x = t^2, y = t - \frac{t^3}{3}$ about x-axis. 05

Q.3 a) Prove that $\int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin\theta}} \int_0^{\pi/2} \sqrt{\sin\theta}\, d\theta = \pi$ 05

b) Change the order of integration in the double integration $\int_0^5 \int_{2-x}^{2+x} f(x,y)dydx$ 05

c) Find the area bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ about x-axis 05

Q.4 a) Prove that $\int_a^b (x-a)^m (b-x)^n dx = (b-a)^{m+n+1}\, \beta(m+1, n+1)$ 05

b) Evaluate $\int\int r \sin\theta\, dr\, d\theta$ over the area of the cardioid $r = a(1+\cos\theta)$ above the initial line. 05

c) Find the volume bounded by the cylinder $y^2 = x, x^2 = y$ and the plane $x + y + z = 2$ and $z = 0$ 05

Q.5 a) Evaluate $\int_0^{\infty} \frac{x^8(1-x^6)}{(1+x)^{24}}\, dx$ 05

b) Evaluate $\int_{-1}^{1} \int_0^z \int_{x-z}^{x+z} (x+y+z)dxdydz$ 05

c) Find the RMS value of $3\sin 2x$ over a period. 05

Section B

Q.6 Attempt any five of the following. 10

a) Write half range cosine series for $f(x)$ in the interval (O, L) and its coefficients.

b) Define Fourier series of $f(x)$ in the interval $(0, 2\pi)$

c) Define rank of a matrix.

d) If $f(x) = x\sin x; x \in (-\pi, \pi)$ then find Fourier coefficient a_0

e) Find the Fourier series coefficient a_0 and a_n for $f(x) = x^3,\ -1 < x < 1$

f) Define matrix if its quadratic form is $2x_1^2 + 3x_2^2 + x_3^2 - x_1x_2 + 5x_1x_3 + 6\,x_2x_3$

g) Check following vectors are linearly dependent or independent.
$X_1 = (1,2), X_2 = (7,9), X_3 = (5,3)$

h) If the characteristic equation for the matrix A is $\lambda^3 - 18\lambda^2 + 45\lambda = 0$, then find Eigen values of the matrix A.

Q.7 a) Find Fourier series of the function $f(x) = \sin hax;\ -\pi < x < \pi$ 05

b) Find rank of matrix by normal form. 05

$$\begin{bmatrix} 1 & 2 & 1 & 2 \\ 1 & 3 & 2 & 2 \\ 2 & 4 & 3 & 4 \\ 3 & 7 & 4 & 6 \end{bmatrix}$$

c) Test the following equations for consistency and solve if consistent. 05

$x + 2y + 3z = 14$
$2x - y + 3z = 8$
$-x + 2y + z = 4$
$3x + y - 4z = 0$

Q.8 a) Find half range cosine series of the function $f(x) = (x-1)^2 in\ 0 < x < 1$ 05

b) Find Eigen value and Eigen vector corresponding to the largest Eigen value for the matrix 05

$$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$$

c) Find the characteristic equation of matrix A. verify that it satisfy Cayley-Hamilton theorem. 05

$$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$

Q.9 a) Find the Fourier series to represent 05

$f(x) = 4 - x;\ 3 < x < 4$
$= x - 4;\ 4 < x < 5$

b) Find half range sine series for the function $f(x)$ where 05

$f(x) = \frac{\pi}{3},\ 0 \le x \le \frac{\pi}{3}$
$= 0 \quad \frac{\pi}{3} \le x \le \frac{2\pi}{3}$
$= \frac{-\pi}{3} \quad \frac{2\pi}{3} \le x \le \pi$

c) Check the consistency & solve 05

$x + y + z = 0$
$2x - y - 3z = 0$
$3x - 5y + 4z = 0$
$x + 17y + 4z = 0$

Q.10 a) Find Fourier series for $f(x) = |x|;\ -2 < x < 2$ 05

b) Find the half range sine series 05
$f(x) = \frac{100x}{l}$ over $0 < x < l$

c) Given the transformation 05

$$Y = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 0 & -3 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Find the co-ordinate (x_1, x_2, x_3) corresponding to (2, 3, 0)

Total No. of Printed Pages:3

SUBJECT CODE NO:- H-102
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All) (CGPA)
Engineering Mathematics-II
(REVISED)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
i) Questions number 1 and 6 are compulsory.
ii) Solve any two questions from remaining of each section.
iii) Figure to the right indicates full marks.
iv) Assume suitable data, if necessary.

Section A

Q.1 Solve any five from the following 10

a) Find the integrating factor of $y(logy)dx + (x - logy)dy = 0$
b) Find the solution of exact differential Equation $(3x^2 + 6xy^2)\,dx + (6x^2y + 4y^3)dy = 0$
c) If $f(x) = \pi^2 - x^2, x \in (-\pi, \pi)$, then find the value of fourier coefficient a_n
d) Define the half range Fourier series in the interval $(0, \pi)$.
e) If $f(x) = x, x \in (0,2\pi)$ then find Fourier coefficient b_n.
f) Find the equation of asymptote to the curve $y^2(x + a) = x^2(3a - x)$.
g) Find the length of an arc curve $y = f(x) from\ x = a\ to\ x = b$.
h) The curve $r = a + bcos\theta$ is symmetrical about……

Q.2
a) Solve $(1 + y^2)dx = (tan^{-1}y - x)dy$. 05
b) Find Fourier series for $f(x) = \frac{\Pi - x}{2}$ in the interval $0 < x < 2\pi$. 05
c) Trace the curve $y^2(a - x) = x^2(a + x)$ with full justification. 05

Q.3
a) Solve $tany\ \frac{dy}{dx} + tanx = cosycos^2x$ 05
b) Obtain the Fourier series for the function $f(x) = \begin{cases} \pi x; 0 \le x \le 1 \\ \pi(2 - x); 1 \le x \le 2 \end{cases}$ 05
c) Trace the curve $x = a\,(\theta + \sin\theta)$; $y = a(1 - cos\theta)$ with full justification. 05

Q.4
a) Solve $\frac{dy}{dx} + \frac{ycosx + \sin y + y}{sinx + x\,cosy + x} = 0$ 05
b) Obtain the Fourier series for the function $f(x) = x\,sinx\ in\ x \in (-\pi, \pi)$ 05
c) Find the perimeter of the loop of the curve $3ay^2 = x\,(x - a)^2$ 05

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Q.5

a) Solve $L\frac{di}{dt} + Ri = 200\ cos300t$ 05
When $R = 100\ ohms, L = 0.05\ Henery\ and$
also find i given that i(0) = 0

b) Obtain half Range Fourier Series for $f(x) = (x-1)^2$ in the interval (0,1) 05

c) Find the total length of the cardioid $r = a(1 + cos\theta)$. 05

Section-B

Q.6 Solve any Five from the following 10

a) Write the reduction formula for
$\int_0^{\frac{\Pi}{2}} sin^m x\ cos^n x\ dx$

b) Define Beta Function and
Evaluate $\beta\left(\frac{1}{2}, \frac{3}{2}\right)$

c) Evaluate
$\int_0^{\Pi}\int_0^{a\ sin\theta} r dr d\theta$

d) Evaluate
$\int_0^a \int_0^b \int_0^c xyz\ dx\ dy\ dz$

e) Change the order of integration
$\int_0^1 \int_0^{\sqrt{1-x^2}} f(x,y) dx\ dy$

f) Evaluate
$\int_0^3 \int_0^{1/x} ye^{xy} dxdy$

g) Write
$\int_0^2 \int_0^{\sqrt{2x-x^2}} \frac{x}{\sqrt{x^2+y^2}} dx\ dy$

into polar co-ordinate form.

h) The surface area of solid formed the revolution of the curve
$y = f(x) about\ x\ axis\ from\ x = a\ to\ x = b\ is$ ... ...

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Q.7 a) Evaluate 05

$$\int_0^1 \frac{dx}{\sqrt{1-x^4}}$$

b) Evaluate 05

$\int_{-2}^{2}\int_{0}^{\sqrt{4-y^2}}(4-y)dx\,dy$

c) By double integration, find the area included between the curve 05
$r = a(sec\theta + cos\theta)$ and its asymptote

Q.8 a) Evaluate 05

$$\int_0^1 x^{n-1}[log\ (1/x)]^{m-1}dx$$

b) Change the order of integration 05

$$\int_0^1 \int_{x^2}^{2-x} f(x,y)dx\,dy \ \ by\ showing\ region$$

c) Calculate the volume of the solid bounded by 05
$x = 0, y = 0, lx + my + nz = 1\ and\ z = 0$

Q.9 a) Prove that 05

$$\int_0^1 \frac{x^{m-1} + x^{n-1}}{(1+x)^{m+n}}dx = \beta\ (m,n)$$

b) By changing into polar co-ordinates evaluate 05

$$\int_0^{1/\sqrt{2}} \int_y^{\sqrt{1-y^2}} \log(x^2 + y^2)\,dx\,dy$$

c) Find the volume bounded by 05
The cylinder $x^2 + y^2 = 4\ and\ y + z = 3\ and\ z = 0$.

Q.10 a) Evaluate 05

$$\int_0^{\infty} \sqrt[4]{x}\, e^{-\sqrt{x}}dx$$

b) Evaluate 05

$$\int_0^{log2} \int_0^x \int_0^{x+y} e^{(x+y+z)}dx\,dy\,dz$$

c) Find surface area between the 05
curves $y = 2 - x\ and\ y^2 = 2(2-x)$
by double integration

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Total No. of Printed Pages:04

SUBJECT CODE NO:- H-312
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Engineering Graphics
(OLD)

[Time: Four Hours] **[Max. Marks: 80]**

Please check whether you have got the right question paper.

N.B
1. Solve any three questions from each section.
2. Assume suitable data if necessary and mention it clearly.
3. Figures to right indicate full marks.

Section A

Q.1 A top view of 75 mm long line AB measures 65 mm while the length of it's front view is 50 mm . Its one end A is 10mm above HP and 12mm in front of VP. Draw the projections of line AB and determine it's inclination with HP and VP. 13

Q.2 A line CD 65mm long having its end C 20mm above H.P and 25mm infront of V.P. and the end D is 40 mm above HP ,65 mm in front of VP. Draw its projections and determines inclination with HP and VP 13

Q.3 A circular plate of 60 mm diameter resting in VP on the points on circumference and inclined to VP such that its front view appears as an ellipse with minor axis 40 mm . Draw the projections of the plane when the front view of diameter through the point in VP is 30^0 inclined to HP . 13

Q.4 A square pyramid with base 40mm side and axis 70mm long is resting in H.P. on one of the corners of it's base, the longer edge contained by the corner in HP is 40^0 inclined to H.P. Draw the projections of the solid when it's axis is 30^0 incline to V.P. 13

Q.5 A pentagonal pyramid of base side 40mm and axis 75mm long is resting in H.P. with one of the side of base perpendicular to VP. It is cut by a section plane perpendicular to V.P. and 45^0 inclined to H.P. passing through the midpoint of the axis. Draw the projections of the solid, sectional top view and true shape of the section. 14

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Section B

Q.6 Draw the development of lateral surface of the cylinder shown in fig. 1 13

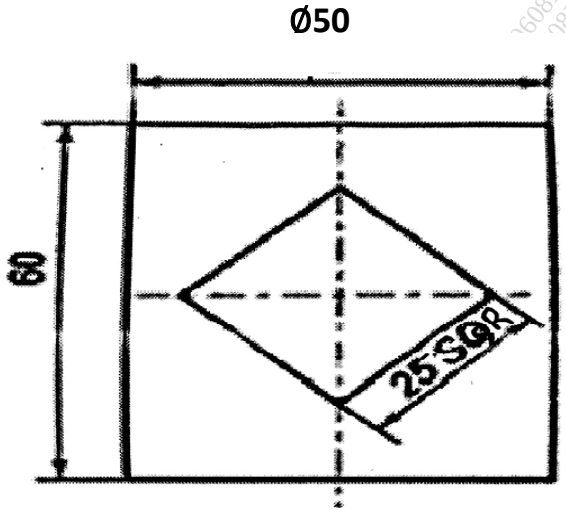

Fig .1

Q.7 Figure 2 shows the pictorial view of the object. Draw the F.V.T.V. and RHSV. 14

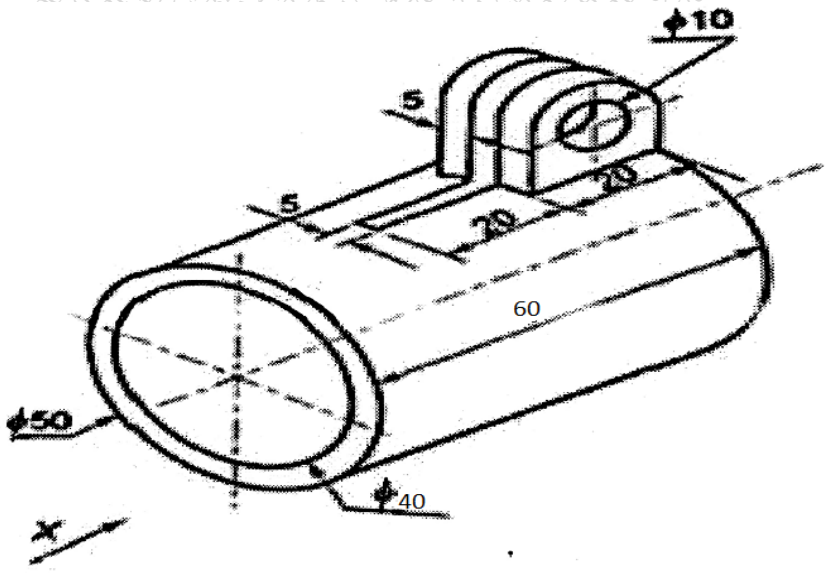

Fig.2

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Q.8 Front view and top view of an object are given in figure 3. Redraw front view, top view and add Left hand side view. 13

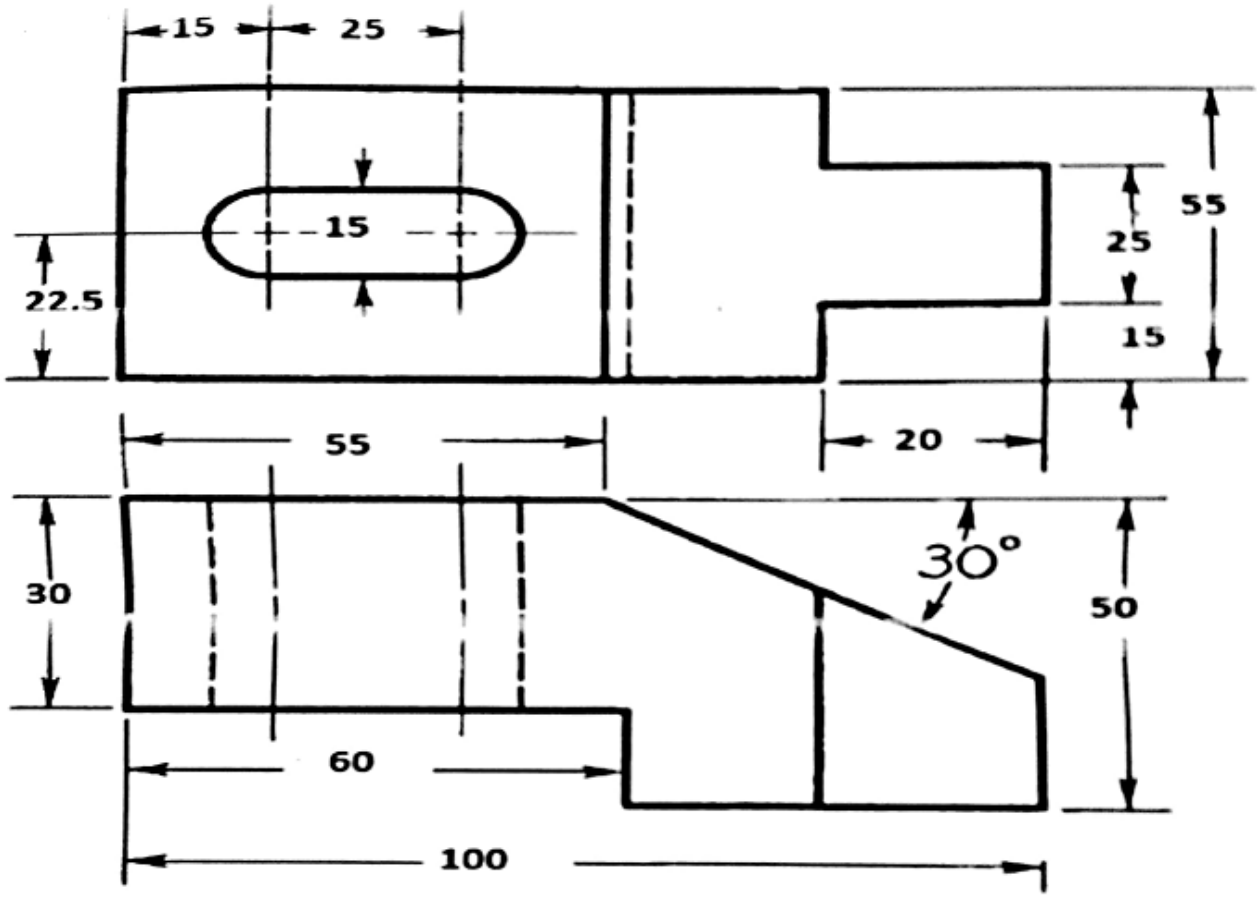

Fig.3

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Q.9 Fig . 4 shows the F.V. and T.V. of an object, draw the isometric view. 13

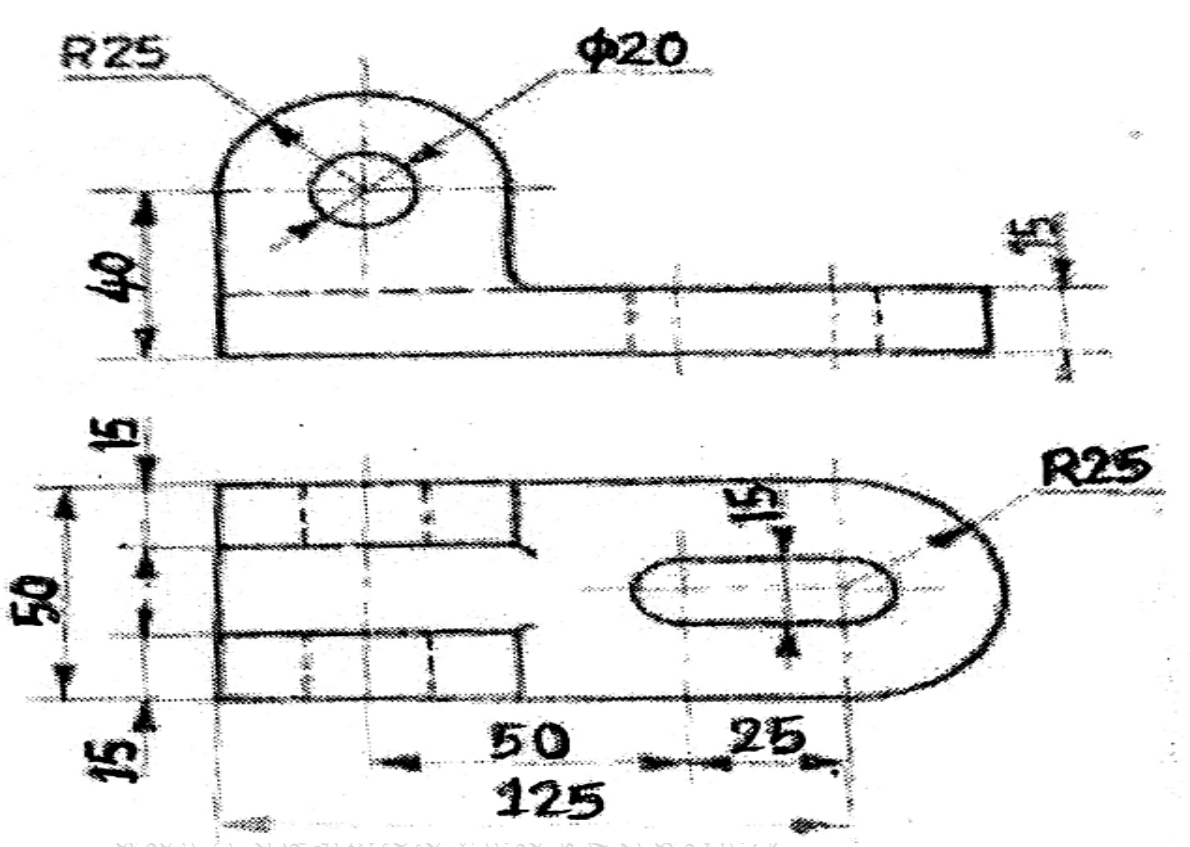

Fig. 4

Q.10 Draw the free hand sketches of the following(Any three) 13

a) Eye Foundation Bolt.
b) Square headed bolt
c) British Association thread
d) Acme threads
e) Hexagonal Nut and Bolt.

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Total No. of Printed Pages:3

SUBJECT CODE NO:- H-313
FACULTY OF SCIENCE AND TECHNOLOGY
F.E. (All)
Engineering Graphics
(REVISED)

[Time: Four Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
1. Solve any three questions from each section.
2. Assume suitable table data if necessary and mention it clearly.
3. Figures to right indicates full marks.

Section A

Q.1 Top view of line AB measures 60MM and inclined to the reference line at 60^o . The end point A is 15mm above the H.P and 20mm in front of V.P Draw the projection of line when it is inclined at 45^o to The H.P find True length and inclination of line with V.P. 13

Q.2 The front view of line AB measures 70mm and makes an angle of 45^o with X-Y. A is in H.P and VT of line is 15mm below H.P The line is inclined 30^o to the V.P draw the projection of line AB and find its true length inclination with H.P and its H.T. 13

Q.3 Draw the projection of circle of 80mm diameter resting on the H.P on a point A of the circumference. It is inclined to the H.P such that the plan is an ellipse of minor axis 50mm. The plane of the diameter through A is making an angle of 45^o with V.P measure the angle of plane with H.P. 13

Q.4 A right regular hexagonal pyramid, side of base 40mm and axis 80mm is resting on corner of its base In H.P in such a way that its apex 55mm above H.P and plan of the axis makes 45^o with V.P. 14

Q.5 A pentagonal pyramid side of base 30mm and axis 80mm long, is resting on its base in H.P with edge of base parallel to the V.P it is cut by a section plane perpendicular to V.P and inclined 60^o to the H.P and bisecting the axis. Draw the front view, sectional top view and True shape of section. 13

Section B

Q.6 Pictorial view of an object is shown in fig. 6.1 draw its 13
- i) Front view in the direction of – X
- ii) Top view
- iii) Side view from right

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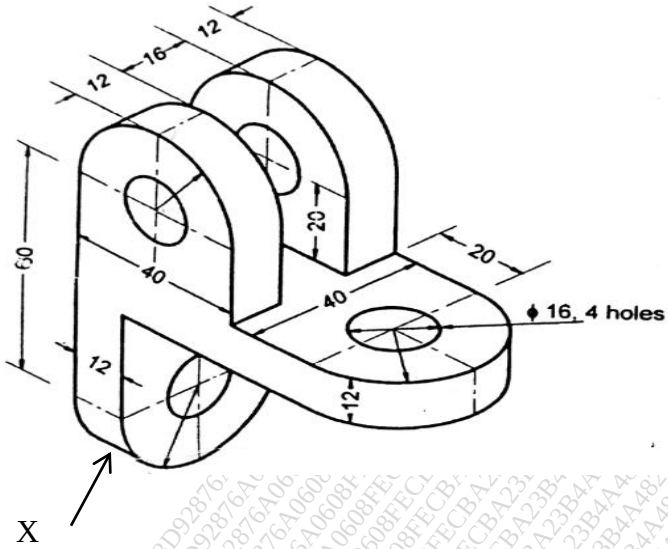
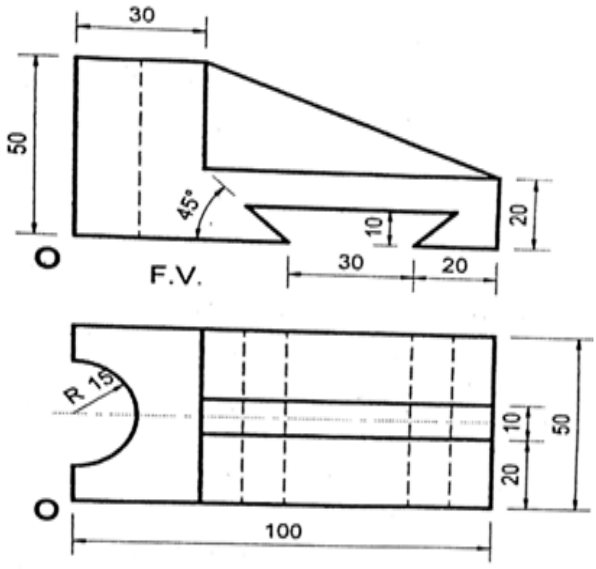


fig. 6.1

Q.7 Fig. 7.1 shows the F.V and T.V of an object, draw its Isometric view. 13



T.V

Fig. 7.1

Q.8 Pictorial view of an object is shown in fig. 8.1 draw its 14

i) Sectional F.V along A-A in the direction of – X
ii) Top view
iii) Side view from left

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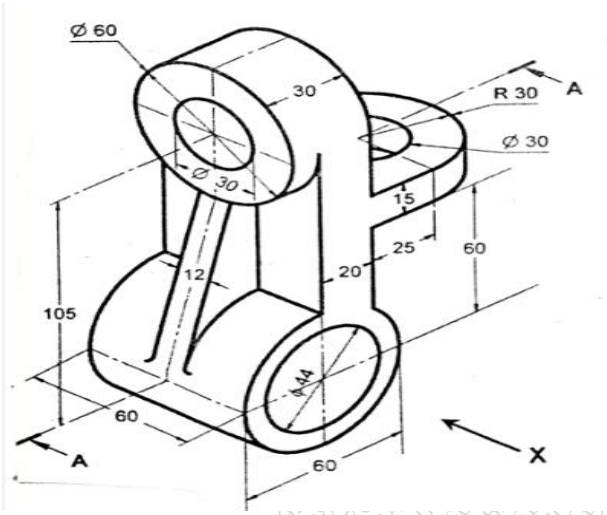

fig. 8.1

Q.9 Solve any two of the following 13

i) The distance between the foci of an ellipse is 120mm and the minor axis is 75mm long draw an ellipse by any method and show tangent and Normals at any point on the curve.

ii) A circle of 60mm diameter rolls on horizontal line for half revolution then on vertical line for another half revolution draw the curve traced out by a point 'P' on the circumference of circle.

iii) A point P is 40mm and 60mm respectively from two straight lines which are at right angles to each other. Draw the curve passing through the point P within 10mm distance from each line.

Q.10 Draw free hand sketches of the following machine parts (any three) 13

i) Double – Riveted (zig – zag) lap joint.

ii) Rag foundation bolt

iii) Square Headed bolt

iv) Rock nut

v) Whitworth thread.

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Total No. of Printed Pages:03

SUBJECT CODE NO:- H-291
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Engineering Mathematics - I
(OLD)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B i) Q. No. 1 and Q. No. 6 are compulsory
ii) solve any two questions from question Nos. 2,3,4 & 5
iii) solve any two questions from question Nos. 7,8,9 and 10

Section A

Q.1 Solve any five of the following 10

a) Find general value of $logi$

b) Express in polar form $\left(\frac{2+i}{3-i}\right)^2$

c) Find n^{th} derivative of $cos3x\ sin6x$

d) Obtain the expansion of $cosx$

e) Evaluate $\lim_{x\to 0} \frac{coshx-cosx}{xsinx}$

f) State comparison test

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

h) Find integrating factor of
$sin2x\frac{dy}{dx} = y + tanx$

Q.2 a) If $|\mathrm{Z}_1 + \mathrm{Z}_2| = |\mathrm{Z}_1 - \mathrm{Z}_2|$ then prove that the difference of amplitude of Z & Z_2 $is\ \frac{\pi}{2}$ 05

b) Find n^{th} derivative of $y = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ 05

c) Solve 05
$(y^2e^{xy^2} + 4x^3)dx + \left(2xy\ e^{xy^2} - 3y^2\right)dy = 0$

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Q.3 a) Expand $\sin^7\theta \cos^3\theta$ in a series of sines of multiples of θ. 05

b) Prove that $\log(1 + sinx) = x - \frac{x^2}{2} + \frac{x^3}{6} - - -$ 05

c) Solve $\frac{dy}{dx} + \frac{4x}{1+x^2}y = \frac{1}{(x^2+1)^3}$ 05

Q.4 a) If $\tan(\theta + i\phi) = e^{i\alpha}$ then show that 05
$\theta = \left(n + \frac{1}{2}\right)\frac{\pi}{2}$ & $\phi = \frac{1}{2}\log\tan\left(\frac{\pi}{4} + \frac{\alpha}{2}\right)$

b) Evaluate 05
$\lim_{x\to 0}\left[cotx - \frac{1}{x}\right]$

c) Solve the equation 05
$L\frac{di}{dt} + Ri = 20\cos(30t)\ where\ R = 10chms$
L=0.5 henry and find i, given that i=0 when t=0

Q.5 a) Solve the equation $x^7 + 1 = 0$ 05

b) Find the orthogonal trajectory of $r^n = a\sin n\theta$ 05

c) Test the convergence of the series: 05
$\sum_{n=1}^{\infty}\frac{2^n}{n^3+1}$

Section B

Q.6 Solve any five 10

a) Find asymptotes of the curve $y^2(x - 2a) = x^3 - a^3$

b) Find the symmetry of the curve $x^3 + y^3 = 3axy$

c) Length of the curve of the form $r = f(\theta)$ between the lines $\theta = \alpha\ to\ \theta = \beta$ is ----

d) Find first and second partial derivatives of $\mathrm{Z} = x^3 + y^3 - 3axy$ with respect to 'x'

e) If $u = \log_e\left(\frac{x^4+y^4}{x+y}\right)\ then\ find\ x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$

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f) If $x = rcos\theta, \quad y = rsin\theta \ \ then \ find \ \frac{\partial(x,y)}{\partial(r,\theta)}$

g) $f(x, y)$ has minimum value at (a, b) if ------

h) Find the pole of $r^2 = a^2 cos2\theta$

Q.7 a) Trace the curve $y^2(x^2 + y^2) + a^2(x^2 - y^2) = 0$ with full justification 05

b) If $u = x^2 \tan^{-1}\left(\frac{y}{x}\right) - y^2 \tan^{-1}\left(\frac{x}{y}\right) \ \ show \ that$ 05
$\frac{\partial^2 u}{\partial x \partial y} = \frac{x^2 - y^2}{x^2 + y^2} \ and \ \ \frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$

c) If $u = xyz, \quad v = x^2 + y^2 + z^2$ 05
$w = x + y + z \ \ find \ \frac{\partial(x,y,z)}{\partial(u,v,w)}$

Q.8 a) Trace the curve $r = a + b\,cos\theta, a < b$ with full justification 05

b) If $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right) \ then \ prove \ that \ \ x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \tan u$ 05

c) Find the length of the loop of the curve $y^2 = x\left(1 - \frac{x}{3}\right)^2$ 05

Q.9 a) Trace the curve $x = a(\theta - sin\theta), \ \ y = a(1 + cos\theta)$ with full justification 05

b) If $v = (x^2 + y^2 + z^2)^{-1/2} \ then \ prove \ that \ \frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} + \frac{\partial^2 v}{\partial z^2} = 0$ 05

c) A rectangular box open at the top is to have volume of 32 cubic ft. find the dimension of the box requiring least material for its construction 05

Q.10 a) Find maximum and minimum value of $f(x, y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$ 05

b) Find the total length of the curve $\quad x^{2/3} + y^{2/3} = a^{2/3}$ 05

c) Find the length of the curve $r = q\theta$ in the range $0 < \theta < \alpha$ 05

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Total No. of Printed Pages:03

SUBJECT CODE NO:- H-292
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Engineering Mathematics - I
(REVISED)

[Time: Three Hours] **[Max. Marks: 80]**

Please check whether you have got the right question paper.

N.B
1) Use of non-programmable calculator is allowed
2) Q. no.1 and Q. no. 6 are compulsory
3) Solve any two question from Q. nos. 2,3,4 and 5
4) Solve any two question from Q. nos. 7,8,9 and 10

SECTION A

Q.1 Attempt the following (Any five): 10

a. State condition for consistency of a system of homogeneous equation.

b. Define Eigen values and Eigen vectors.

c. Find rank of $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 1 & 2 & 3 & 4 \\ 1 & 3 & 5 & 1 \\ 1 & 2 & 3 & 4 \end{bmatrix}$

d. Define linear transformation.

e. Find modulus and amplitude of $Z = 1 - i$

f. Simplify $\frac{(cos\theta + isin\theta)^4}{(cos\theta - isin\theta)^3}$

g. State De-Moivre's theorem.

h. Find general value of $log(-10)$.

Q.2 a. Find rank of matrix A by reducing it to its normal form. 05

$$A=\begin{bmatrix} 3 & -4 & -1 & 2 \\ 1 & 7 & 3 & 1 \\ 5 & -2 & 5 & 4 \\ 9 & -3 & 7 & 7 \end{bmatrix}$$

b. Find Eigen values and Eigen vector corresponding largest Eigen value of following matrix. 05

$$A=\begin{bmatrix} 0 & -1 & -2 \\ 2 & 3 & 2 \\ 1 & 1 & 3 \end{bmatrix}$$

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c. The centre of regular hexagon is at origin and one vertex is $\sqrt{3}+i$ on Argrand's diagram, determine the other vertices 05

Q.3 a. Test for consistency and solve if possible the following system of equations 05
$2x+3y-4z=-2,\quad x-y+3z=4, 3x+2y-z=-5$

b. Verify cayley-Hamilton theorem and find inverse of 05
A=$\begin{bmatrix}1 & 0 & 2\\ 0 & 1 & 2\\ 1 & 2 & 0\end{bmatrix}$

c. Show that all roots of equation $(x+1)^7=(x-1)^7$ are given by $\mp icot\left[k\frac{\pi}{7}\right]$. Where k=1, 2, 3. 05

Q.4 a. Examine for linear dependence or linear independence and find relation if dependence the following set of vectors. 05
$[2,3,-1,-1],\ [1,-1,-2,4],\ [3,1,3,-2],\ [6,3,0,-7]$

b. Separate real and imaginary parts of $\sin^{-1}[e^{i\theta}]$. 05

c. If $cosec\left(\frac{\pi}{4}+ix\right)=u+iv, prove\ that\ (u^2+v^2)^2=2(u^2-v^2)$. 05

Q.5 a. Given the transformation 05
Y=$\begin{bmatrix}1 & -2 & 3\\ 2 & 0 & -3\\ 1 & 1 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}$ find co-ordinates $[x_1\ \ x_2\ \ x_3] to\ (2,3,0) in\ y$.

b. Separate i^{i^i} into real and imaginary parts. consider only principle values 05

c. If $\tan(\alpha+i\beta)=i, \alpha, \beta$ being real, prove that α is indeterminate and β is infinite 05

SECTION B

Q.6 Attempt the following (Any five): 10

a. Find n^{th} order derivation of $y=\frac{1}{2x+5}$

b. State Maclaurin's theorem and derive series for $tanx$

c. State Cauchy's n^{th} root test

d. Find stationary values of function $x^3y^2(1-x-y)$

e. Find Jacobian $\frac{\partial(x,y)}{\partial(r,\theta)}\ if\ u=rcos\theta, v=rsin\theta$

f. If $u=\sin\sqrt{\frac{x-y}{x+y}}$ prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=0$

g. Evaluate $\lim_{x\to 1}\{\frac{\log sinx}{cosx}\}$

h. Derive series for $\log(x+1)$

Q.7 a. Find the n^{th} derivative of $\frac{x}{(x-1)(x-2)(x-3)}$ 05

b. Find $\frac{dy}{dx}, if\ (cosx)^y=(siny)^x$. 05

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c. If $u = \sec^{-1}\frac{(x^3+y^3)}{x+y}$ *prove that* $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2cotu$ 05

Q.8

a. $Evaluate\ \lim_{x\to 0}\left(\frac{tanx}{x}\right)x^{\frac{1}{2}}$. 05

b. $if\ u = x + y + z,\ \ u^2v = y + z,\ \ u^2w = z,\ \ find\ \frac{\partial(x,y,z)}{\partial(u,v,w)}$. 05

c. $if\ u = \log(x^3 + y^3 + z^3 - 3xyz)$ show that 05

1. $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = \frac{3}{x+y+z}$
2. $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u = \frac{-9}{(x+y+z)^2}$.

Q.9

a. Prove that $cosx\ \ coshx = 1 - \frac{2^2x^4}{4!} + \frac{2^4x^8}{8!}$ 05

b. Expand $x^4 - 3x^3 + 2x^2 - x + 1$ in powers of x-3 05

c. If $x + y = 2e^{\theta}cos\emptyset\ and\ x - y = 2ie^{\theta}sin\emptyset$ show that $\frac{\partial^2 u}{\partial\theta^2} + \frac{\partial^2 u}{\partial\emptyset^2} = 4xy\frac{\partial^2 u}{\partial x\partial y}$ 05

Q.10

a. Prove that $\tanh^{-1}x = x + \frac{x^3}{3} + \frac{x^5}{5} + \cdots$ 05

b. Test for convergence or divergence of $\sum\frac{n^2(n+1)^2}{n!}$. 05

c. Divide 24 into three parts such that the continued product of first, square of second and cube of third may be maximum. 05

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H-263

Total No. of Printed Pages:1

SUBJECT CODE NO:- H-263
FACULTY OF SCIENCE AND TECHNOLOGY
F.E. (All)
Engineering Physics
(OLD)

[Time: Two Hours] **[Max.Marks:40]**

Please check whether you have got the right question paper.

N.B i) Q. No.1 is compulsory.
ii) Solve any two questions from the remaining questions.
iii) Figures to the right indicate full marks.

Q.1 Attempt any five questions from the following. 10

(a) State Bethe's law. Write the formula.
(b) What is velocity selector? Explain its function.
(c) Explain diffraction of X-rays.
(d) What is diffraction? Explain its types.
(e) Define the terms optical activity and specific rotation.
(f) What is isotope effect in super conductors.
(g) Draw a well labeled diagram of nuclear reactor.
(h) Write one reaction each of nuclear fusion and nuclear fission.

Q.2 (a) What is Compton's effect? Derive an expression for change in wavelength in Compton effect. 07
(b) With a neat diagram, describe the construction and working of Aston's mass spectrograph and derive the condition of focusing. 08

Q.3 (a) Define the term resolving power of grating and hence obtain an expression for the same. 06
(b) Describe with a neat diagram, the construction and working of Laurentz's Half Shade Polarimeter. 05
(c) Newton's rings are formed in the reflected light of wavelength 5900A°. The diameter of 10^{th} dark ring is 0.5cm. Determine the radius of curvature of the lens used. 04

Q.4 (a) State and explain Meissner effect 05
(b) Describe the construction and working of G.M. counter. Describe Plateau region. 05
(c) Describe the terms i) P-P cycle 05
ii) C-N cycle

Q.5 Write short notes on the following 15
i) Bragg's X-ray Spectrometer
ii) Determination of refractive index of liquid using Newton's rings pattern.
iii) Betatron.

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Total No. of Printed Pages:1

SUBJECT CODE NO:- H-264
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Computer Fundamentals - II
(REVISED)

[Time: Two Hours] **[Max. Marks: 40]**

Please check whether you have got the right question paper.

N.B i) Question no.1 is compulsory and solve any two Questions from the remaining.

Q.1 Solve any five questions. 10

a) Define String in C
b) Explain gets() & puts() functions.
c) Explain pointer Operator * and &.
d) Define structures in C.
e) What is a file?
f) Define open Source Software.

Q.2 a) Write a program for counting length of string. 07

b) Explain function Call by Reference with example. 08

Q.3 a) Write a program using array of structure for storing information of three Employees & print the same on terminal. 08

b) Explain different file opening modes in detail. 07

Q.4 a) What is free software ? Explain with four types of freedom for free software. 08

b) Explain Open Source Software vs Free Software. 07

Q.5 a) Explain string handling functions with example. 08

b) Explain Union with suitable example. 07

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Total No. of Printed Pages:03

SUBJECT CODE NO:- H-347
FACULTY OF SCIENCE AND TECHNOLOGY
F.E. (All)
Basic Electrical Engineering
(REVISED)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
1. Q.5 and Q.10 are compulsory.
2. Attempt total three questions from each section.
3. Make suitable assumptions where necessary stating the same.

Section A

Q.1 a) Explain constructional features and working of Nickel Cadmium battery. 06

b) Explain how a capacitor is charged from dc supply through a series resistance. Derive the equation of charging current. Draw its graph and define time constant for this circuit. 08

Q.2 a) For the circuit in figure 1 find voltages V_1 and V_2. 06

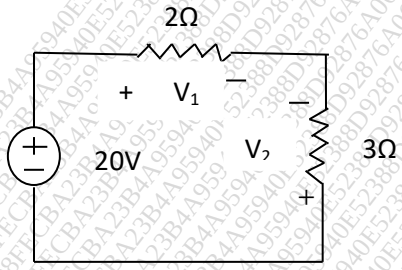

Figure 1

b) All resistors in figure 2. Are 1Ω each find req. across C & D 04

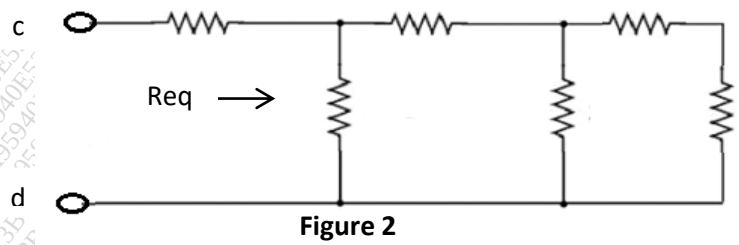

Figure 2

c) Obtain V_o in the circuit of figure 3. 04

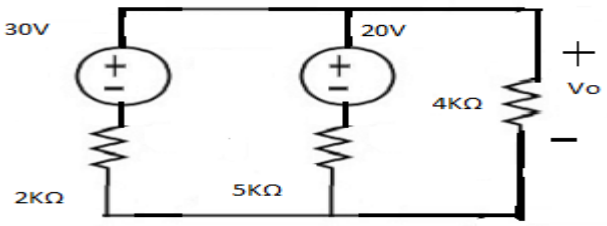

Figure 3

Q.3 a) State and explain superposition theorem with a simple example. 04

b) Define the following for a magnetic circuit. 06

1) mmf
2) Flux
3) Reluctance

c) Using the superposition theorem find V_o in the circuit of figure 4. 04

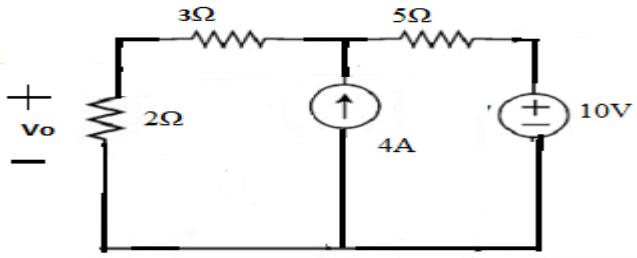

Figure 4

Q.4 a) Compare electrical and magnetic circuits for similarities and dissimilarities. 08

b) Derive expression for energy stored in magnetic field. 06

Q.5 Answer the following (any six) 12

a) Write the voltage division rule and current division rule.
b) What is time constant of a capacitor?
c) Write types of batteries of cells.
d) Write the application of Kirchhoff's law.
e) Write applications of maximum power transfer.
f) Figure 5 represents a model of solar photovoltaic panel. Given V_s=30V, R1=20Ω, i_L=1A find R_L

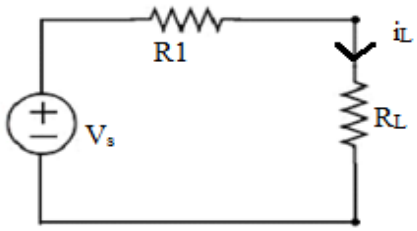

Figure 5

g) Explain the terms
1) Self-inductance
2) Mutual inductance

h) State the Flemings left and right hand rule.

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Section B

Q.6 a) With the help of proper circuit and vector diagram explain the phenomenon of resonance in AC parallel circuit. 08

b) A series circuit of 12Ω resistance 0.3H inductor and a variable capacitor is connected across 100V, 50Hz supply the capacitor is adjusted to give unity p.f. Calculate the power down by the circuit and capacitance of capacitor. 06

Q.7 a) For R-L circuit prove that $I = \frac{V}{\sqrt{R^2+X_L^2}}$ where $X_L = \omega L$. 05

b) Define RMS and average value of AC quantity. 05

c) Define active, reactive and apparent power and draw power triangle. 04

Q.8 a) With the aid of neat circuit diagram explain the method of finding efficiency of single phase transformer by direct loading. 07

b) Compare between resonance in series circuit and parallel circuit. 07

Q.9 a) A single phase transformer has 350 primary and 1050 secondary turns. The net cross sectional area of the core is 55 cm^2. If the primary winding the connected to a 400V, 50Hz single phase supply calculate. 07

i. The maximum value of flux density in the core and

ii. The voltage induced in the secondary winding.

b) Write short note on losses in transformer. 04

c) Draw only CFL lamp in details. 03

Q.10 Answer the following (any six) 12

a) What is Q-factor? Write its equations.

b) What are general two types of construction of the transformers?

c) State why ideal transformer has no iron losses.

d) What is the function of watt meter?

e) What is the use of multimeter?

f) Write the significance of earthing.

g) List the sources of electrical power generation.

h) What is a electronic choke?

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Total No. of Printed Pages:2

SUBJECT CODE NO:- H-416
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Engineering Chemistry & Environmental Sci.
(OLD)

[Time: Two Hours] **[Max.Marks: 40]**

Please check whether you have got the right question paper.

N.B
1. Q.no.1 is compulsory.
2. Solve any two questions from the remaining questions.
3. Figures to the right indicate full marks.
4. Use of non-programmable calculator is allowed.

Q.1 Answer the following questions any five: 10

a) Define polymer, monomer.
b) What is action of NaCl in regeneration of zeolite?
c) Define temporary & permanent hardness.
d) What are the impurities observed in coal?
e) Give composition of petroleum.
f) What are advantages of vulcanized rubber?
g) What are the raw materials used to prepare styrene rubber?
h) Distinguish between solid fuel & Gaseous fuel.

Q.2 a) Explain in detail zeolite process of water softening? Write its limitations & advantages. 06

b) Explain EDTA method for determination of hardness? 05

c) Give application of PH-meter. 04

Q.3 a) What is proximate analysis of coal sample? Write its significance. 06

b) Write the characteristic of Good Fuel. 05

c) Define: 04
1) Viscosity
2) Viscosity index
3) Octane number
4) Calorific value

Q.4 a) Give the preparation, properties & uses of PMMA. 06

b) Write the difference between natural rubber & vulcanization of rubber. 05

c) Define elastomers? Explain the structure of elastomer. 04

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Q.5	a)	Explain in detail Ion-exchange water purification method.	05
	b)	Define Alkalinity? Give its disadvantages.	04
	c)	Write the difference between addition & condensation polymerization.	03
	d)	Write significance of ultimate analysis of coal.	03

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Total No. of Printed Pages:01

SUBJECT CODE NO:- H-417
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Computer Fundamentals - I
(REVISED)

[Time: Two Hours] **[Max. Marks: 40]**

Please check whether you have got the right question paper.

N.B i) Question no. 1 is compulsory and solve any two Questions from the remaining.

Q.1 Solve any five questions: 10

a) Explain any two data types in C.
b) Explain any two keywords in C.
c) Explain syntax of if-else statement.
d) Write syntax of for loop.
e) Explain logical operators.
f) What is Array?

Q.2
a) Explain different types of operators in C. 05
b) Explain C tokens with appropriate examples. 05
c) Determine the hierarchy of operations and stepwise evaluate the expression : 05
$k = 3/2 * 4 + 3/8 + 3$ (assume k as int)

Q.3
a) Write a program to read two numbers and find power of one number raise to another. 08

b) Explain Function call by reference with suitable example. 07

Q.4
a) Write a program to read a number and find whether it is positive or negative. 05
b) Explain the difference between while and do while loop with suitable example. 05
c) Find the output of the following 05

```
void main()
{
int x=4,y=3,z;
z=x-- -y;
printf("\n %d %d %d",x,y,z);
}
```

Q.5
a) Write a C program to sort 10 numbers using bubble sort method. 08

b) Explain Recursion with suitable example. 07

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Total No. of Printed Pages:01

SUBJECT CODE NO:- H-381
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Elements of Civil Engineering
(OLD)

[Time: Two Hours] **[Max.Marks: 40]**

Please check whether you have got the right question paper.

N.B i)Q. No. 1 is compulsory.
ii) Attempt any two questions from remaining questions.
iii) Draw neat sketch wherever necessary.

Q.1 Attempt any five: 10

i) Define surveying and leveling.
ii) Define height of instrument.
iii) Enlist various types of tapes.
iv) Define back bearing.
v) State two benefits of irrigation.
vi) Enlist various methods of population forecasting
vii) Draw a labelled diagram of ranging rod.

Q.2 a) Explain Direct and indirect ranging in briefly. 05
b) The following levels were taken with 4m leveling staff and leveling instrument on a sloping ground. 10
0.578, 0.933, 1.768, 2.450, 3.005, 0.567, 1.181, 1.888, 3.679, 0.612, 0.705, 1.810.The first reading taken on the Benchmarks was 58.250m. Calculate R.L. of various points by H.I.method.

Q.3 a) Explain septic tank and soak pits in detail. 08
b) Explain necessity of watershed management works. 07

Q.4 a) Explain working of prismatic compass. 08
b) Explain procedure for calculating reduced level by height of instruments method. 07

Q.5 a) Explain roof top rain water harvesting with neat sketch. 08
b) Draw flow diagram of water treatment plant of various treatment units. 07

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Total No. of Printed Pages:02

SUBJECT CODE NO:- H-382
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Basic Civil Engineering
(REVISED)

[Time: Two Hours] **[Max. Marks:40]**

Please check whether you have got the right question paper.

N.B
1) Question no 1 is compulsory.
2) Attempt any two questions from Q.2 to Q.5.
3) Draw neat sketches wherever necessary.
4) Assume suitable data if necessary.

Q.1 Answer the following (any five): 10

a) Define Sedimentation.
b) Draw a Labelled diagram of soaked pit.
c) Define filtration.
d) Define surveying.
e) Enlist types of dam.
f) Define fire demand.
g) Define water shed area.
h) Draw figure of Septic Tank.

Q.2 Answer the following.

a) Which points should be considered in the selection of site for residential building 06
b) The following consecutive readings were taken with dumpy level and 4m staff on a continuously sloping ground 1.65, 1.92, 2.5, 1.6, 1.85, 2.15, 2.50, 2.10, 2.68, 2.90. The instrument was shifted after taking 2nd and 5th reading. Calculate R.L.S of all the points. If R.L. of B.M. =135.00M. 09

Q.3 Answer the following.

a) What are the salient features of Nagpur Road Plan. Also write the advantages of road transportation? 07
b) Describe with neat sketch the prismatic compass. 08

Q.4 Answer the following.

a) Draw the flow diagram of water treatment plant and function of different unit. 05
b) Explain in detail Arithmetic Increase method. 05
c) Using geometric Increase method, find the population for the year 1980, 1990, 2000, 2010. 05

Year	1940	1950	1960	1970
Population	9050	13,050	18,600	29,500

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Q.5 Answer the following.

a) Which factors are considered for selection of site for a dam? 05

b) Necessity of Irrigation and benefits of irrigation. 05

c) What is the necessity of rain water harvesting? 05

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Total No. of Printed Pages:2

SUBJECT CODE NO: H-346
FACULTY OF SCIENCE AND TECHNOLOGY
F.E. (All)
Elements of Electrical Engineering
(OLD)

[Time: Two Hours] **[Max.Marks:40]**

Please check whether you have got the right question paper.

N.B
1) Q. No. 1 is compulsory.
2) Solve any three questions from Q. No.2 to Q. No. 5.

Q.1 Solve any five 10

1) Define RTC, positive temperature coefficient.
2) State statement of Thevenin's theorem.
3) State the factor affecting the value of resistance. State the effect of temp. on resistance on
   a) Gold
   b) Rubber
4) Define mmf, magnetic flux, Reluctance
5) Define time constant of capacitor.
6) Draw the curve for capacitor voltage during the charging and discharging.
7) State maximum power transfer Theorem.
8) Define reluctance, permeability.

Q.2 Solve any two 10

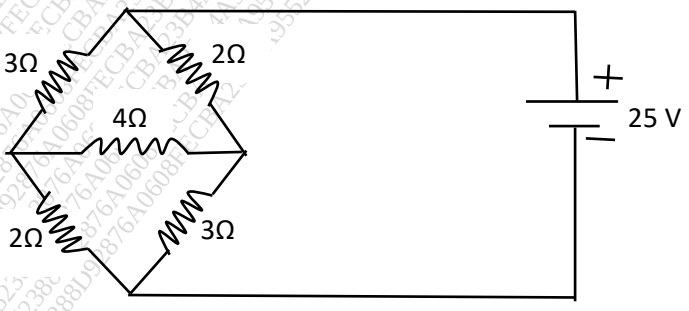
a) With the help of neat fig. explain magnetic Leakage and fringing.

b) State and explain superposition Theorem.

c) Derive the charging equation of the capacitor.

Q.3 Solve any two 10

a) Find the current through 4Ω resistor by using loop Analysis.



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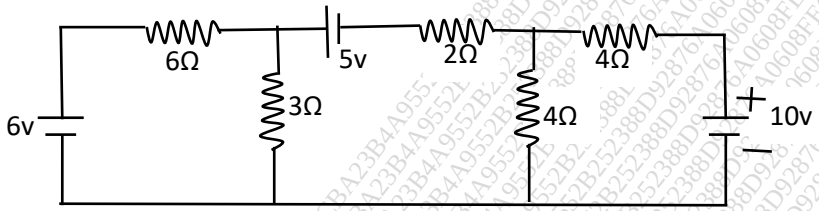
b) If α_0 , α_1 , α_2 are temperature coefficient at 0℃ , t℃ , t_2℃ respectively
Prove $\alpha_2 = \frac{\alpha_1}{1+\alpha_1 (t_2-t_1)}$

c) Find current through 3Ω resistance using loop analysis.



Q.4 Solve any two. 10

a) Explain the copper loss.

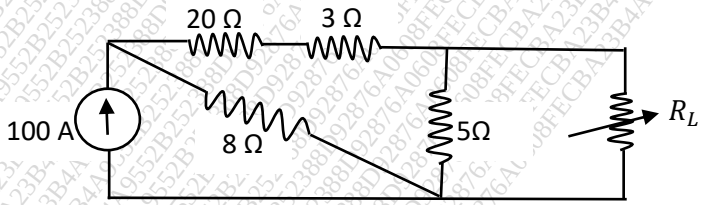
b) Compare electric and Magnetic circuit.

c) With neat diagram explain the concept of self and mutually induced emf.

Q.5 Solve any two. 10

a) Compare self-inductance and mutual inductance.

b) Find value of R_L such that maximum power transferred to it. Also find maximum power dissipated.



c) State and explain effect of temp on R.T.D.

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Total No. of Printed Pages:02

SUBJECT CODE NO:- H-191
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All)
Elements of Electronics & Comp. Engg.
(OLD)

[Time: Two Hours] **[Max. Marks: 40]**

Please check whether you have got the right question paper.

N.B i) Q.No.1 is compulsory.
ii) solve any two questions from remaining questions
iii)assume suitable data wherever necessary

Q.1 Solve any five : 10

a. Define resistance. Enlist the various types of resistors.
b. Draw the construction of air core inductor.
c. What is need of rectifier? Explain.
d. Enlist the various types of the filters.
e. Draw the symbols of following devices
   i. P-N junction diode
   ii. n-p-n transistor
   iii. P-channel JFET
   iv. SCR
f. Draw the zener diode as a shunt voltage regulator
g. Find the one's compliment of the following number: 10110101
h. Draw the symbol & truth table of EX-OR gate

Q.2 a. Define capacitance. Give the brief classification of capacitors. 08
b. Draw and explain the v-1 characteristics of a diode. 07

Q.3 a. What is rectifier? With the help of neat circuit diagram explain bridge rectifier. Also draw its input and output waveforms. 08
b. What is voltage regulator? Explain the positive and negative voltage regulators IC's. (78XX and 79XX). 07

Q.4 a. Perform the following conversions: 08
i. $(51\ C8)_{16=}(?)_8=(?)_2$
j. $(10101101)_2=(?)_{16=}(?)_{10}$
b. Why NOR gate is called as universal logic gate? Construct AND, OR, NOT gates using NOR gate only. 07

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Q.5 Write a short note on (any three): 15

i. JFET
ii. Three terminal Ic voltage regulators
iii. De morgan's theorems
iv. Binary addition

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Total No. of Printed Pages:04

SUBJECT CODE NO:- H-301
FACULTY OF SCIENCE AND TECHNOLOGY
S.E. (All Branches)
Engineering Mathematics - III
(OLD)

[Time: Three Hours] **[Max.Marks: 80]**

Please check whether you have got the right question paper.

N.B
1) Q. No. 1 and Q. No. 6 are compulsory.
2) Solve any two out of Q. No. 2,3,4,5
3) Solve any two out of Q. No. 7,8,9,10.
4) Use of non-programmable calculator is allowed.
5) Figures to the right indicate full marks.
6) Assume suitable data, if necessary.

Section A

Q.1 Attempt any five:- 10

a) Solve $\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} - 6y = 0$

b) Find P.I for $\frac{d^3y}{dx^3} + \frac{dy}{dx} = \cos x$

c) Find P.I. for $(D^2 + 2D + 1)y = x$

d) Find β_1 and β_2 if $\mu_1 = 0,\ \mu_2 = 1, \mu_3 = 4,$ and $\mu_4 = 4$

e) If a dice is thrown, what is the probability that outcome will be odd number.

f) Write Kirchoff's voltage law to electrical circuit.

g) What is Kurtosis? Mention its different types.

h) Find the mean for the data

Class:	0-10	10-20	20-30	30-40	40-50	50-60
Freq:	5	9	15	12	10	3

Q.2 a) Solve $(D^2 - 4D + 4)y = e^x \cos^2 x$ 05

b) A 0.1 henry inductor, a 4 microfarad capacitor and generator having emf given by 180 cos40t are connected in series find the charge and current if $i = 0, q = 0\ at\ t = 0$ 05

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c) Find the mean deviation about the median for the distribution. 05

Age in year:	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of members:	3	61	132	153	140	51	2

Q.3 a) Solve without using variation of parameters 05
$(D^2 + 2D + 1)y = e^{-x} \log x$

b) Calculate the coefficient of variation for the data: 05

Class:	2-6	6-10	10-14	14-18	18-22	22-26	26-30
Freq:	1	9	21	47	40	32	25

c) A body weighing 10 kg is hung from a spring. A pull of 20 kg. wt. will stretch the spring to 0.1 m. The body is pulled down to 30 cm. below the static equilibrium position and then released. Find the displacement of the body from its equilibrium position at time t seconds, the maximum velocity and period of oscillation. 05

Q.4 a) Solve by variation of parameters. 05
$(D^2 + 1)y = cosec\ x$

b) 6 coins are tossed 320 times. Using Poisson distribution, find the approximate probability of getting 6 heads at most 2 times. 05

c) The deflection of a strut with one end build in and other supported and subjected to end thrust P satisfies the equation 05
$\frac{d^2y}{dx^2} + a^2y = \frac{a^2R}{P}\ (l - x)$, given that
$\frac{dy}{dx}$=0, y=0 when x=0 and y=0 when x=l

Q.5 a) Solve:- $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 5y = x^2 \sin(logx)$ 05

b) Find the curve of best fit of the type $y = ae^{bx}$ to the following data by method of least squares. 05

x:	1	5	7	9	12
y:	10	15	12	15	21

c) Find the Karl Pearson's coefficient of Skewness for the data 05

Class:	10-19	20-29	30-39	40-49	50-59	60-69
Freq:	5	9	14	20	25	15

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Section B

Q.6 Attempt any five:- 10

a) Find the first approximate value of the root by Newton-Raphson method for $3x = \cos x + 1$

b) Find f(2) for the data

x:	1	3	4
f(x):	-3	9	30

c) Find the values of x,y,z in the first iteration by Gauss-Seidal method.

$3x + 2y = 4.5$
$2x + 3y - z = 5$
$-y + 2z = -0.5$

d) Find $\nabla.\bar{A}$ at the point (1,-1,1) if
$\bar{A} = x^2zi - 2y^3z^2j + xy^2zk$

e) Find the unit vector normal to the surface $x^2y + 2xz^2 = 8$ at the point (1,0,2)

f) Evaluate $\int_C (y^2dx - 2x^2dy)$ along the parabola $y = x^2$ from (0,0) to (2,4).

g) Write the statement of Gauss divergence Theorem.

h) Prove that $\nabla.\bar{r} = 3$

Q.7 a) Solve the equation $\log x = \cos x$ correct to 3 decimal places by Newton Raphson method. 05

b) Find the directional derivative of $\emptyset = xy^2 + yz^3$ at the point (2,-1,1) in the direction of the normal to the surface $x\log z - y^2 = -4$ at (-1,2,1) 05

c) Evaluate by Green's theorem 05
$\oint_C (x^2 - 2xy)dx + (x^2y + 3)dy$, where C is the boundary of the region bounded by the Parabola $y = x^2$ and the line $y = x$.

Q.8 a) Solve by Gauss Seidal Method 05
$6x + y + z = 105$
$4x + 8y + 3z = 155$
$5x + 4y - 10z = 65$

b) Evaluate $\int_C \bar{F}.d\bar{r}$ where 05
$\bar{F} = (3x^2 + 6y)i - 14yzj + 20\,xz^2k$ and C is the straight line joining the points(0,0,0) to (1,1,1)

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c) Prove that 05
$\nabla^2 r^n = n(n+1)r^{n-2}$

Q.9 a) A rod is rotating in plane about one of its ends. If the following table gives the angle θ radians through which the rod is turned for different values of time t seconds. Find its angular velocity when t = 0.7 seconds. 05

x sec:	0.0	0.2	0.4	0.6	0.8	1.0
θ rad:	0.0	0.12	0.48	1.10	2.0	3.2

b) Show that $\bar{F} = (y \sin z - \sin x)i + (x \sin z + 2yz)j + (xy \cos z + y^2)k$ is conservative. Find the corresponding scaler $\emptyset$ such that $\bar{F} = \nabla\emptyset$ 05

c) Evaluate by Stoke's theorem for $\bar{F} = 4yi - 4xj + 3k$, where s is a disk of radius *1* lying on the plate z=1 and c is its boundary. 05

Q.10 a) Apply Runge-Kutta fourth order method to find an approximate value of y when x=0.2 given that $\frac{dy}{dx} = x + y^2$ and y=1 when x=0. 05

b) Using Euler's modified formula, find an approximate value of y when x=0.02. Given that $\frac{dy}{dx} = x^2 + y$ and y(0)=1. Taking h=0.02 05

c) Use Gauss divergence theorem to evaluate $\iint_S \bar{F} \cdot \overline{ds}$ where 05
$\bar{F} = 4xi - 2y^2j + z^3k$ and S is a closed surface bounded by $y^2 = 4x$, $z = 0$, $z = 3$ and $x = 1$.

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Total No. of Printed Pages:05

SUBJECT CODE NO:- H-111
FACULTY OF SCIENCE AND TECHNOLOGY
S.E. (All Branches)
Engineering Mathematics - IV
(REVISED)

[Time: Three Hours] **[Max. Marks: 80]**

Please check whether you have got the right question paper.

N.B
1. Q. No. 1 and 6 are compulsory
2. Solve any two questions from the remaining questions of each section.
3. Figures to the right indicate full marks.
4. Assume suitable data, if necessary.

Section A

Q.1 Attempt any five 10

1. Find the Laplace transform of $e^{-t}\cos at$

2. Find the Laplace transform of $e^{-t}\frac{sint}{t}\delta(t-3)$.

3. Find the Laplace transform of $f(t)=\cos\left(t-\frac{2\pi}{3}\right), t>\frac{2\pi}{3}$

   $= 0, \quad t<\frac{2\pi}{3}$

4. Find the inverse Laplace transform of $\frac{s}{s^2a^2+b^2}$

5. Find the inverse Laplace transform of $\frac{s\,e^{-as}}{s^2+b^2}$

6. Form the partial differential equation by eliminating a and b from the equation

   $2z=\frac{x^2}{a^2}+\frac{y^2}{b^2}$

   OR

   Find z-transform of $\sin(\frac{k\pi}{2})$

7. Solve pq= 1

   OR

   Find the z-transform of $ka^k, k\geq 0$

8. Solve $2x\ \frac{\partial z}{\partial x} - 5y\frac{\partial z}{\partial y} = 0$

OR

Find the Z-transform of $e^k\ cos\alpha k, k \geq 0$

Q.2

a. Find Laplace transform of $e^{-4t}\int_0^t tsin3t\ dt$ 05

b. Find the inverse Laplace transform of $\cot^{-1}(s+1)$ 05

c. Find the solution of $\frac{\partial u}{\partial t} = h^2\frac{\partial^2 u}{\partial x^2}$ 05

using the conditions $u(o,t) = 0 = u(l,t), u\ (x,0) = \sin\left(\frac{\pi x}{l}\right)$

OR

find the z-transform of $\sin^2\left(\frac{k\pi}{4}\right), k \geq 0$

Q.3

a. Evaluate : $\int_0^\infty e^{-2t}t\sin ht\ dt$ 05

b. Find inverse Laplace transform by convolution theorem $\frac{s}{(s^2+a^2)(s^2+a^2)}$ 05

c. Solve $p\ tanx + q\ tany = tanz$ 05

OR

Find z-transform of $\frac{2^k}{k},\ k \geq 1$

Q.4

a. Express the following function in terms of Heaviside unit step function and hence find its Laplace transform $f(t) = 2,\ 0 < t < \pi$ 05

$= 0,\quad \pi < t < 2\pi$

$= sint, t > 2\pi$

b. Solve by Laplace transform $\frac{dy}{dt} + 2y + \int_0^t y\ dt = sint,\ y(0) = 1$ 05

c. Solve $p(1+q) = qz$ 05

OR

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Find the inverse z-transform of $\frac{2Z}{(z-1)(z^2+1)}$ by residue method

Q.5 a. Find the Laplace transform of periodic function $f(t) = t, 0 < t < a$ 05
$= 2a - t, a < t < 2a$ and
$f(t) = f(t + 2a)$

b. Solve the following simultaneous L.D.E. by Laplace transform method 05

$$\frac{dx}{dt} - y = e^t, \frac{dy}{dt} + x = sint\ ,$$

Given $x(0) = 1,\ y(0) = 0$

c. Solve:$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ in the interval $0 \le x \le \pi$ subjected to the following conditions 05
$u(o, y) = 0 = 4(\pi, y),\ u(x, 0) = 1$
And $u(x, y) = 0\ as\ y \to \infty$

OR

Solve the difference equation by using Z-transform
$2y(k + 2) - 5y(k + 1) + 2y(k) = 0, k \ge 0$
Given $y(0) = 0,\ y(1) = 1$

Section B

Q.6 Attempt any five 10

a. Find the first approximate value of the root $(i.e.x_1)$ by Newton-Raphson method for $3x = \cos x + 1$

b. Find f(3) for the data

X :	1	2	4
f(x) :	14	15	5

c. Find the values of x ,y, z, in the first iteration by Gauss seidal method for
$2x + y + 6z = 9$
$8x + 3y + z = 24$
$2x + 17y + 4z = 35$

d. Find $\frac{dy}{dx}$ at x=1930 for the data

X:	1930	1940	1950	1960
Y:	40	60	79	103

e. Evaluate $\int_c e^z dz, where\ c: |z| = 1$

f. Find the image of $|z| = 2\ under\ w = \frac{1}{z}$

g. Find the poles and residues at each poles for $f(z) = \frac{Z^2}{(Z-1)(Z+2)}$

h. Find the values of A and B if $f(z) = X^2 + Ay^2 + iBxy$ is analytic

Q.7 a. Fit a straight line $y = a + bx$ to the following data by the method of least squares 05

X:	0	1	3	6	8
Y:	1	3	2	5	4

b. Solve by Gauss seidal method 05

$83x + 11y - 4z = 95$
$7x + 52y + 13z = 104$
$3x + 8y + 29z = 71$

c. Show that the function $w = \frac{4}{Z}$ transform the straight line x=a in the z-plane into a circle in w-plane 05

Q.8 a. Find $y'(o)$ and $y"(o)$ from the given table 05

X:	0	1	2	3	4	5
Y:	4	8	15	7	6	2

b. Show that $u = -sinx\ sinhy$ is harmonic and hence find its harmonic conjugate 05

c. Evaluate $\oint_c \frac{dz}{z^2 sinhz}$, where c is the circle $|Z - 1| = 2$ by cauchy's residue theorem 05

Q.9 a. Given that $\frac{dy}{dx} = \frac{y-x}{y+x}, y(o) = 1$ find y(0.1) by Euler's modified method. 05

b. If $f(z) = u + iv$ is an analytic function then find $f(z) if\ 2u + v = e^x(cosy - siny)$ 05

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c. Evaluate $\oint_c \frac{z-3}{z^2+2z+5} dz$, where $c: |z+1-i| = 2$ by using cauchy's integral formula. 05

Q.10 a. Using Runge-kutta fourth order method find y(0.1)given that 05

$$\frac{dy}{dx} = 3x + \frac{y}{2}, \qquad y(o) = 1, \qquad take\ h = 0.1$$

b. Expand $f(z) = \frac{1}{(z+1)(z+3)}$ for $0 < |z-1| < 2$ by Laurent series 05

c. Evaluate $\int_0^{\pi-\pi i} e^{\bar{z}}\, dz$, along the curve x=t and y= -t 05

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Total No. of Printed Pages:03

SUBJECT CODE NO:- H-302
FACULTY OF SCIENCE AND TECHNOLOGY
S.E. (All)
Engineering Mathematics - III
(REVISED)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
1. Q.No.1 from section A and Q.No.6 from section B are compulsory.
2. Solve any two questions from remaining of each section.
3. Figures to the right indicate full marks.
4. Assume suitable data, if necessary.

Section A

Q.1 Solve any five from the following. 10

a) Solve $(D^4 - 1)y = 0$.
b) Solve $(D^3 - 2D^2 + 4D - 8)y = 0$.
c) Find the particular integral of $(D^3 + 8)y = e^{-2x} + 4$.
d) Find the particular integral of $(D^3 + 8)y = x^4 + 2x + 1$.
e) The charge Q of a condenser of capacity C is discharged in a circuit of resistance R and self-inductance L. Find the differential equation of the circuit.
f) A column of length *'l'* is fixed at one end is completely free at other. The load *'p'* is axially applied at the free end, the origin is taken at the fixed end and $'\alpha'$ is the lateral displacement of the free end, its deflection is given by_____.
g) Find the Fourier transform of

$$f(x) = \begin{cases} e^{-\alpha x} ; & 0 < x < \infty \\ 0 ; & x < 0 \end{cases}$$

h) Find the Fourier sine transform of

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

Q.2 a) Solve $(D^3 - 4D)y = 2\cosh^3 2x$. 05

b) In an L-C-R circuit, the charge q on a plate of a condenser is given by $L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{c} = E\sin pt$. The circuit is tuned to resonance so that $p^2 = \frac{1}{LC}$. If initially the current i and the charge q be zero, show that for small values of $\frac{R}{L}$, the current at time t is given by $\frac{Et}{2L}\sin pt$. 05

c) Find the Fourier cosine and sine transform of $f(x) = 2e^{-5x} + 5e^{-2x}$. 05

Q.3 a) Solve $(D^4 + 2D^2 + 1)y = x^2\cos x$. 05

b) The deflection of a strut of length *l* with one end $(x = 0)$ built in and the other supported and subjected to end thrust P, satisfies the equation. 05
$\frac{d^2y}{dx^2} + \alpha^2 y = \frac{a^2R}{P}(l - x)$. Prove that the deflection curve is

$$y = \frac{R}{P}\left(\frac{\sin ax}{a} - l\cos ax + l - x\right), where\ al = \tan al.$$

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c) Find the Fourier cosine integral of the function $f(x) = e^{-x}\cos x$. 05

Q.4

a) Solve $(1+x)^2\frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = \sin 2\{\log(1+x)\}$. 05

b) A mass 40 kg is attached to a spring for which $k = 640\ N/m$ brought to rest. Find the position of the mass at time *t* if a force equal to $10\sin 2t$ is applied to it. 05

c) Find *f(x)* if its Fourier sine transform is $\frac{1}{\omega}e^{-\alpha\omega}$. Hence deduce $F_s^{-1}\left(\frac{1}{\omega}\right)$. 05

Q.5

a) Solve by method of variation of parameter $\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$. 05

b) Solve without variation parameter $(D^2 + 3D + 2)y = \cos(e^x)$. 05

c) Solve for *f(x)* from the integral equation $\int_0^\infty f(x)\cos sx\,dx = e^{-s}$. 05

Section B

Q.6 Solve any five from the following. 10

a) Find the mode of the following data

Age	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Freq.	3	61	132	153	140	51	2

b) If $\emptyset = \tan^{-1}\frac{y}{x}$, find $div(grad\ \emptyset)$.

c) State Guass divergence theorem.

d) Determine the area under the normal curve to the right of 1.0

e) Coefficient of Quartile Deviation= _____.

f) If the probability of defective mobile phone is 0.2, find the i) mean, ii) the standard deviation for the distribution of mobile phone in a total of 200.

g) Find the curl of $\overline{A} = e^{xyz}(i+j+k)\ at\ the\ point\ (1,2,3)$.

h) A particle moves along the curve $\overline{r} = e^{-t}\cos t\, i + e^{-t}\sin t\, j + e^{-t}k$. Find the magnitude of velocity at time t.

Q.7 a) Find the Karl-Pearson's coefficient of skewness for the following data 05

Class	55-65	65-75	75-85	85-95	95-105	105-115	115-125
Frequency	10	12	15	20	14	07	02

b) Evaluate $\iint_s (y^2z^2i + z^2x^2j + x^2y^2k)\,dz$, where s is the upper part of the sphere $x^2 + y^2 + z^2 = 9$ above the XOY plane by using Guass-divergence theorem. 05

c) Prove that $\overline{F} = (y^2 - z^2 + 3yz - 2x)i + (3xz + 2xy)j + (3xy - 2xz + 2z)k$ is both solenoidal and irrotational. 05

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Q.8 a) A gas is being compressed in a closed cylinder and the value of pressure and corresponding volumes at constant temperature are as shown: 05

Pressure	160	180	200	220	240	260	280	300
Volume	0.034	0.036	0.030	0.027	0.024	0.025	0.020	0.019

Find the coefficient of correlation for these values.

b) Prove that $\nabla.\left(\frac{\overline{a}\times\overline{r}}{r}\right)=0$. 05

c) Evaluate $\oint_c[(x^2+2y)dx+(4x+y^2)dy]$ by Green's theorem where c is the boundary of the region bounded by $y=0, y=2x \; and \; x+y=3$. 05

Q.9 a) According to past record of one day international between India and Pakistan, India has won 15 matches and lost 10. If they decide to play a series of 6 matches now, what is the probability of India winning the series. 05

b) Verify Stoke's theorem for $\overline{F}=(y-z+2)i+(yz+4)j-xz\,k$ over the surface of cube $x=0, y=0, z=0, x=2, z=2$ above the XOY plane (open at the bottom). 05

c) Find the directional derivative of $\emptyset=x^2y^2z^2 \; at \; (1,1,-1)$ in the direction of tangent to the curve $x=e^t, y=2\,sint+1, z=t-cost \; at=0$. 05

Q.10 a) Determine the equation of the regression line of inductive reactance on frequency for the following data 05

Frequency	50	100	150	200	250	300	350
Inductance	30	65	90	130	150	190	200

b) A manufactures known from experience that the resistance of resistors he produced is normal with mean $\mu=100\;ohms$ and standard deviation $\delta=2\;ohms$. What percentage of resistors will have resistance between 98 ohms and 102 ohms? 05

c) Evaluate $\int_c \overline{F}.dr$, over the curve $x^2+y^2=1, z=1$ in positive direction from $(0,1,1) \; to \; (1,0,1)$, where $\overline{F}=(yz+2x)i+xz\,j+(xy+2z)k$. 05

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