DADI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Approved by A.I.C.T.E., New Delhi & Affiliated to JNTUK, Kakinada)

An ISO 9001:2008, ISO 14001:2004 & OHSAS 18001:2007 Certified Institute.

I B.TECH - II SEM Question Bank (2018-19)

Subject Name: ENGINEERING PHYSICS Branch: CIVIL Faculty: Mr. T R K PYDIRAJU

UNIT-1

1. a) State and explain the Principle of superposition of waves.- 4M
   b) Explain the formation of Newton's rings and obtain an expression for the diameter of the dark rings in reflected system..– 6M
2. a) In Newton's rings experiment, diameter of the tenth dark ring due to wavelength 6000Å in air is 0.5 cm. Find the radius of curvature of the lens.– 4 M
   b) If the air film in the Newton's rings apparatus is replaced by an oil film, then how does the radius of the rings change? Explain. – 6M
3. a) What are the necessary conditions to get clear and distinct interference fringes – 4M
   b) Describe principle ,construction and working of Michelson Interferometer. - 6M
4. a) Explain the colours in a thin film when exposed it to a sun light – 4M
   b) Explain why the centre of Newton's rings is dark in the reflected system. Why are they circular? 6M
5. a) Distinguish between Monochromatic and Polychromatic light sources, Give one example for each
   b) With a ray of diagram, discuss the theory of thin films and the condition constructive and destructive interference in the case of reflected light.—7M
6. a) Describe principle ,construction and working of Febry-Perot Interferometer. - 6M
   b) In Newton's rings experiment, diameter of 10^{th} dark ring due to wavelength 6000 A in air is 0.5 cm. Find the radius of curvature of lense.

UNIT—II

1. a) What are the types of diffraction and give the difference between them ? 4 M
   b) Obtain the condition for primary maxima in Fraunhofer diffraction due to single slit and derive an expression for width of the central maxima - 6 M
2. a) What is the difference between interference and diffraction –4M
   b) Explain the diffraction due to two parallel slits and obtain the Intensity of light on the screen.—6M
3. a) Define the grating and Explain with necessary theory, the Fraunhofer diffraction due to 'N'parallel slits.– 6 M
   b) Calculate the maximum number of order possible for a transmission grating - 4 M
4. a) What happens to the diffraction fringes, if the slit width is reduced in single slit experiment? Explain why? - 6 M
   b) A grating has 6000 lines/cm.Find the angular separation between two wavelengths of 500 nm and 510 nm in 3^{rd} order - 4M

5. a) What is meant by Diffraction of light? Explain it on the basis of Huygen's wave theory ? 4 M
   b) Explain the theory of plane transmission grating abd derive equations for maxima and minima.- 6M
6. a) Define resolving power of grating and explain Rayliegh criterion for resolution and determine the resolving power of the Telescope - 6 M
   b) How many orders will be visible, if wave length of light is 5000 A ? Given that the number of lines per centimeter on the grating is 6655. - 4 M

UNIT – III

1. a) What is a half wave plate and Quarter wave plate? Deduce an expression for its thickness-6 M
   b) Calculate the thickness of half wave plate of quartz for a wavelength 500nm. Here μe= 1.553 and μo= 1.544. - 4 M
2. a) Distinguish between polarized and un polarized lights –3M
   b) State and explain Brewster's law? Discuss how the plane, Circular and Elliptical
3. a) Write a note on double refraction? 4M
   b) Explain the principle, construction and working of a Nicol prism.-6M
4. a) Write the difference between Spontaneous and Stimulated Emissions.– 4M
   b) Explain the working of Ruby laser with the help of neat energy level diagram..– 6M
5. a) What is population inversion and how can it be achieved ?.- 4 M
   b) Explain the working of He-Ne gas laser with the help of neat energy level diagram.- 6 M
6. a) Explain Einstein's coefficients. Derive the relation between them.-5M
   b) What are the characteristics and applications of LASER beam.-5M

UNIT-IV

1 (a) Define sound absorption and absorption coefficient.- 3 M
(b) What is Eyring's formulafor the reverberation time. – 2 M
(c) How will you measure the absorption coefficient of a material ?– 5 M

2 (a) Explain the Sabine formula.- 3 M

(b) Calculate the rate of absoprtion energy of reverberation time -7 M

3 (a) Explain the terms 'Reverberation' and 'Reverberation time'.On what factors does the Reverberation time depend? - 4 M

(b) Derive Sabine's formula for 'Reverberation time'.- 6 M

4 (a) What is Magnetostriction effect ? - 2 M

(b) Describe the production of ultrasonic waves by Magnetostriction method – 8M

5 (a) What is Piezoelectric effect ? - 2 M

(b) Describe the production of ultrasonic waves by Piezoelectric method – 8M

6 (a) What are ultrasonic waves ? Write the properties of ultrasonic waves ? - 5 M

(b) What are ultrasonic transducers and explain their types. – 5 M

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7. Explain Non-Destructive Testing system(NDT) - 10 M

UNIT- V

1 (a) Identify whether unit cells of SC, BCC and FCC lattices are primitive or not. Explain with reason - 3 M

(b) Describe the BCC sub lattice and calculate its atomic packing fraction - 7 M

2 (a) Define crystal lattice, unit cell, lattice parameter and coordination number.- 4 M

(b) Describe the FCC sub lattice and calculate its atomic packing fraction - 6 M

3 (a) Describe the Seven(7) crystal systems with neat diagrams. – 4 M

(b) Obtain the expression for Packing Fractions of SC crystals. – 6M

4 (a) Derive an expression for inter-planar distance between the parallel planes (h k l) - 7 M

(b) The distance between (110) planes in a BCC structure is 0.203 nm. What is the size of the unit cell and radius of the atom?- 3 M

5 (a) What are miller indices? How are they obtained?

(b) Draw the crystal planes having Miller indices (110),(102) and (211) - 3 M

6 (a) State and explain Bragg's law of X-Ray Diffraction.

(b) Silver has FCC structure and its atomic radius is 1.441Å. Find the spacing of (220) planes -4 M

(c) Iron crystallizes in BCC structure. Calculate the lattice constant, given that the atomic weight and density of iron are 55.85 and 7860 kg/m^3 respectively?

7 (a) Explain the terms (1) Mass defect (2) Binding Energy (3) Packing fraction.

(b) Distinguish between Nuclear Fission and Fusion.

8 (a) What is a Nuclear Reactor? Describe the fast breeder Reactor.Whar are its advantages and disadvantageous?

(b) Explain what is meant by Nuclear Fusion and Nuclear Fission?

UNIT—VI

1 (a) Explain the classification of magnetic materials - 6M

(b) Explain the origin of Magnetic Moment – 4M

2 (a) what is Bohr Magnetron? How is it related to magnetic moment of electron?– 4 M

(b) What is meant by Hysteresis of B-H curve? Explain ferro magnetic Hysteresis on the basis of domain theory– 6M

3 (a) What are Soft magnetic materials? Explain their properties. – 5 M
(b) What are Hard magnetic materials? Explain their properties. – 5 M

4 (a) Derive the relation between polarization vector(P), the electric field(E) and displacement(D) vector.- 4 M
(b) What is ionic polarization? Derive an expression for ionic polarizability of ionic crystal? - 6 M

5 (a) Explain the terms 'Dielectric breakdown 'and 'Dielectric strength.– 4M

(b) What is meant by a local field (internal field) in a solid dielectric? Derive an expression for local field for structures possessing cubic symmetry? - 6 M

6) (a) Explain electronic polarization in atoms and obtain an expression for electronic polarizability in terms of radius of atom? – 5 M
(b) What are the polar and non-polar dielectrics? Derive Clausius-Mosotti equation..– 5 M

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I B.Tech (Sem-II) QUESTION BANK

Branch : EEE/ CIVIL Faculty : P.lakshmi narayana

Sub: ENGINEERING DRAWING

UNIT-1

1.(a) construct a plain scale of RF 1:50000 TO show kilometers and hectometers and long enough to measure upto 7 kilometers. Measure a distance of 54 hectometers on your scale(7 M)

(b) Draw an Octagon given the length of side 25mm (4M)

2.(a) the major axis of an ellipse is 100 mm long and the foci are at a distance of 15 mm from its ends. Find the minor axis . draw the ellipse by oblong method

(b) Construct a regular polygon of any number of sides, given the length of its sides equal to 25mm. (4M)

3.(a) construct an ellipse when the distance of the focus from the directrix is equal to 80mm and eccentricity is 3/5

(b) construct a diagonal scale of RF =1/32 showing yards, feet and inches and to measure upto 4yards

4. The major axis of an ellipse is 150mm long and the minor axis is 100m m long. Find the foci and draw the ellipse by arcs of circles method. Draw a tangent to the ellipse at a point on it 25mm above the major axis.(16M)

5. (a) a plot of ground is in the shape of a rectangle 110 x50 M . inscribe an elliptical lawn in it. Take a suitable scale.
(b) The foci of an ellipse are 90 mm apart and the minor axis is 72 mm long. Determine the length of the major axis. Construct the ellipse. (7M)

6. (a) Construct an ellipse when the major axis is 120 mm and the distance between the foci is 108 mm. Determine the length of the minor axis. (7M)

(b) CONSTRUCT A vernier scale to read meters , decimeters and centimeters and long enough to measure upto 4 mt . RF of the scale is 1/20 MARK on your scale a distance of 2.28 mt(7M)

UNIT-II

1.(a) Draw the orthographic projections of the following points:
(i) A, 20mm above HP and 30mm behind VP
(ii) B, 25mm below HP and 25mm in front of VP
(iii) C, 25mm below HP and 30mm behind VP
(iv) D, 30mm below HP and in VP (7M)

(b) The top view of a 75mm long line measures 55mm. The line is in the VP; it's one end being 25mm above the HP. Draw its projections. (7M)

2. (a) draw the projections of a 75mm long straight line in the following positions
(1) parallel to both HP & VP and 25 mm from each
(2) perpendicular to the HP and 20 mm in front of the VP and its one end 15 mm above the HP
(3) inclined at 45^0 to the VP , in the HP and its one end in the VP

(b) A point P is 20mm below HP and lies in the third quadrant. Its shortest distance from xy is 40mm. Draw its projections. (7M)

3. A line AB 50mm long is perpendicular to VP and parallel to HP. Its end A is 20mm in front of VP and the line is 40mm above HP. Draw the projections of the line.(16M)

(i) A, 25mm above H.P and 35mm in front of V.P

(ii) B, 25mm above H.P and 40 mm behind V.P

4. (a) A point 30 mm above xy line is the top view of two points P and Q. he front view of P is 45 mm above the HP while that of the point Q is 35 mm below the HP. Draw the projections of the points and state their positions with reference to the principal planes and their quadrants in which they lie

(b) A vertical line AB 75 mm long has its end A in the HP and 25 mm in front of the VP .A line AC 100 mm long , it is in the HP and parallel to the VP. Draw the projections of the line joining B and C . and determine its inclinations with the HP

5 (a).Two pegs fixed on a wall are 4.5 metres apart. The distance between the pegs measured parallel to the floor is 3.6 metres. If one peg is 1.5 m above the floor, find the height of the second peg and the inclination of the line joining the two pegs with the floor.

(b) A 100 mm long line is parallel to and 40 mm above the HP . ITS two ends are 25 mm and 50 mm in front of the VP respectively. draw its projections and find its inclinations with the VP

6.

(a) A line PQ 40 mm long is parallel to VP and inclined at an angle of $30^0$to HP. The lower end P is 15 mm above HP and 20 mm in front of VP. Draw the projections of the line.(8M)

(b) Draw the projections of a line EF 40 mm long parallel to HP and inclined at $35^0$to VP. E is 20 mm above HP and 15 mm in front of VP.(8M)

UNIT-III

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1. The top view of a 75mm long line AB measures 65 mm , while the length of its front view is 50mm ITS one end A is in the HP AND 12 mm infront of the vp . draw the projections of AB and determine the inclinations with the HP AND the VP(16M)
2. A line CD measuring 80 mm is inclined at an angle of 30^0 to HP and 45^0 TO VP . the point C is 20 mm above HP and 30mm in front of VP. Draw the projections of the straight line(16M
3. A line AB is 75mm long . A is 50 mm infront of VP and 15 mm above HP .B is 15mm in front of vp and is above HP. TOP VIEW OF AB is 50 mm long. Find the front view length and the true inclinations(16M
4. Draw the projections of a line AB , 90 mm long, its mid point M being 50 mm above the HP and 40 mm in front of the VP . the end A is 20 mm above the HP AND 10 mm in front of the VP .SHOW THE TRACES and inclinations of the line with the HP and VP
5. The front view of a line makes an angle of 30^0 with xy. The HT of the line is 45 mm in front of the VP. While its VT is 30 mm below the HP. One end of the line is 10 mm above the HP AND THE OTHER END 100 MM IN FRONT OF THE VP . draw the projections of the line and determine its true length and its inclinations with the HP AND VP
6. A line AB 65 MM LONG HAS ITS END A .15 mm above HP AND 15MM IN FRONT OF VP. IT IS INCLINED AT 55^0 to HP and 35^0 to VP draw its projections(16M)

UNIT-IV

1. A regular pentagonal plate of side 28mm is placed with one side on HP such that the surface is inclined at 45^0 to HP and perpendicular to VP . draw its projections and traces(16M)

2 A thin circular metal plate of 48 mm diameter , having its plane vertical and inclined at 40^0 to VP

Its center is 33mm above HP and 25mm infront of VP. DRAW ITS projections and locate its traces(16M

3 Draw the projections of a circle of 75 mm diameter having the end A of the diameter AB in the horizontal plane , the end B in the vertical plane, and the surface inclined at 30^0 to HP and at 60^0 to the VP(16M

4. Draw the projections of the circle of 50 mm diameter resting in the H.P on a point A on the circumference, its plane inclined at 45^0 to the H.P and The diameter AB making 30^0 angle with the V.P(16 M)

5. A thin circular plate of 70 mm diameter is resting on its circumference such that its plane is inclined 60^0 to the HP and 30^0 to the VP. Draw the projections of the plate

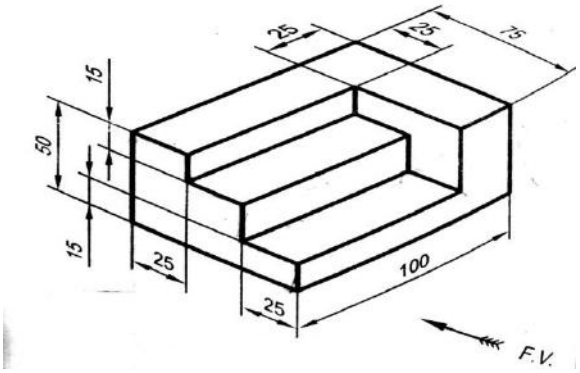
6. A 60^0 set-square of 125 mm longest side is so kept that the longest side in the H.P making an angle of 30^0 with the V.P and the set-square itself inclined at 45^0 to the H.P. Draw the projections of the set- square.

2.

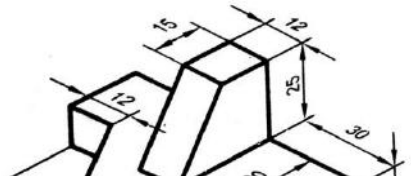
UNIT-V(ALL QUESTIONS CARRY 16M)

1. Draw the projections of a cylinder,base 30mm diameter and axis 40mm long resting with a point of its base circle on HP such that the axis is making an angle of 30^0 with HP and parallel to VP.
2. Draw the projections of a pentagonal prism, base 25 mm side and axis 50 mm long,resting on one of its rectangular faces on the ground, with the axis inclined at 45^0 to the VP
3. Draw the projections of a cylinder 75mm diameter and 100 mm long, lying on the ground with its axis inclined at 30^0 to the V.P and parallel to the ground.
4. Draw the projections of a cone, base 75 mm diameter and axis 100 mm long, lying on the H.P on one of its generators with the axis parallel to the V.P .assuming the cone to be resting on its base on the ground. Draw its projections
5. Draw the projections of a cone of base 30mm diameter and axis 50mm long resting on HP on a point of it's base circle with the axis making an angle of 45^0 with HP and parallel to VP.
6. A hexagonal pyramid , base 25 mm side and axis 50 mm long, has an edge of its base on the ground. Its axis is inclined at 30^0 to the ground and parallel to the VP. Draw its projections

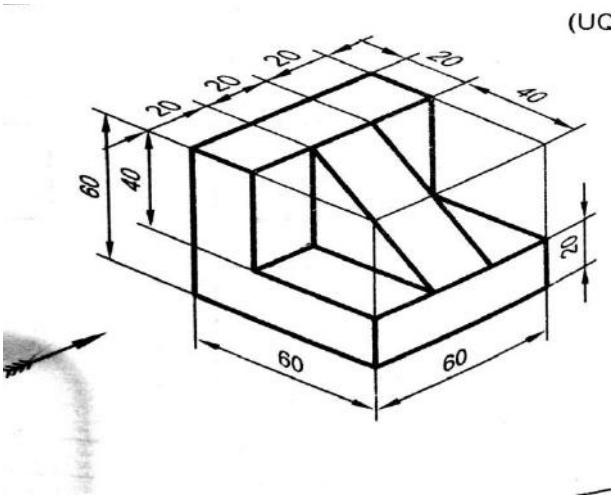
UNIT-VI(ALL QUESTIONS CARRY 16M



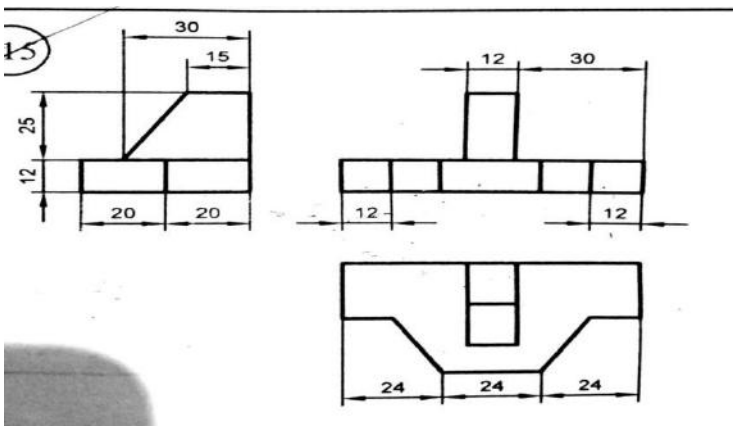
1. convert the following isometric view to ortho graphi
2. Convert the following isometric view to ortho graphic view



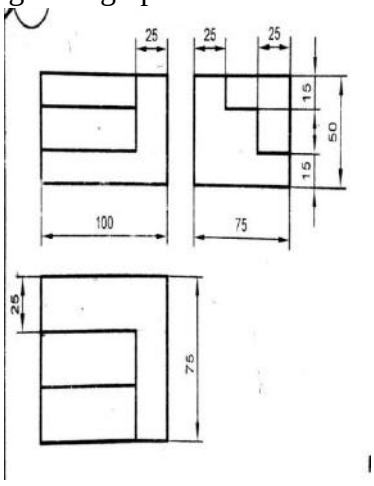
3. Convert the following isometric view to ortho graphic view



4. convert the following orthographic view to isometric view



5. convert the following orthographic view to isometric view



6. convert the following orthographic view to isometric view

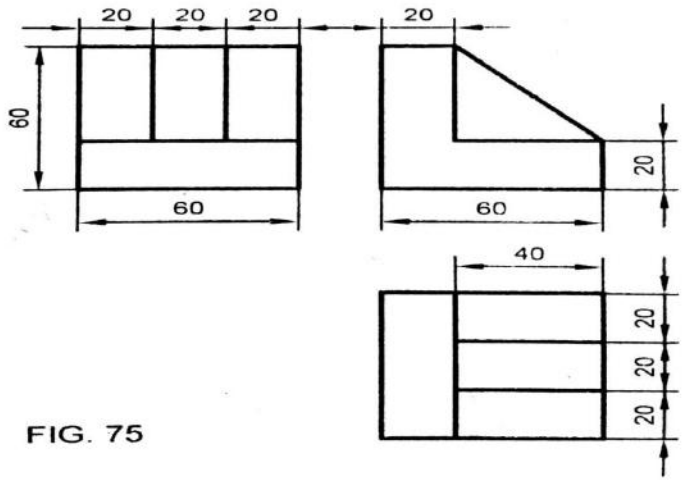
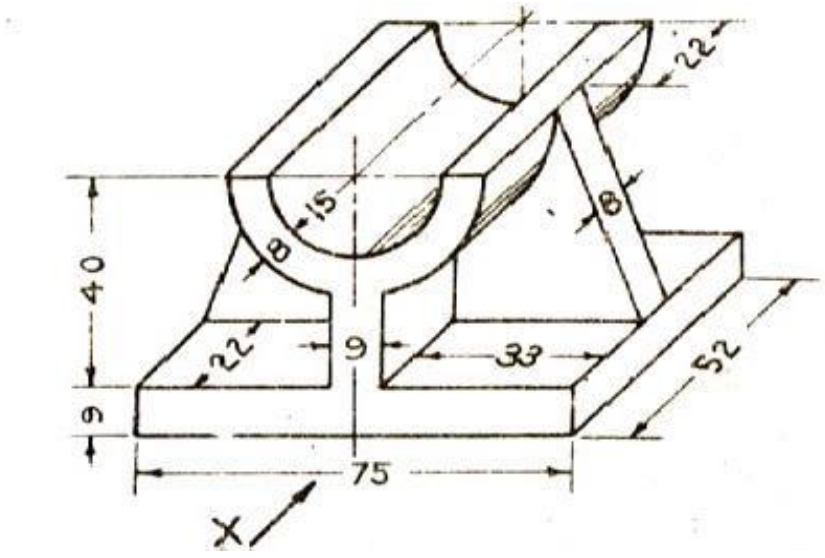


FIG. 75



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DEPARTMENT OF **CIVIL ENGINEERING**

QUESTION BANK

ACADEMIC YEAR: **2018-19** CLASS: **I B.Tech CIVIL**

FACULTY NAME: **B.USHA RANI** SEMESTER: **II**

SUBJECT**: ELEMENTS OF MECHANICAL ENGINEERING**

Course Weight age: **Internal Marks: 30** **External Marks: 70**

MID -I QUESTIONS

UNIT-I

1. Derive the relation between
(a) Modulus of elasticity (E) and modulus of rigidity (G)
(b) Modulus of elasticity (E) and bulk modulus (K)
(c) Hence show that E = 9KN/ (3K+G). [10]

2. a) Define (i) Poisson's ratio and (ii) Volumetric strain [3]
ii. The Modulus of rigidity for a material is $0.51x10^5$ N/mm^2. A 10 mm diameter rod of the Material was subjected to an axial pull of 10 kN and the change in diameter was observed to be $3x10^{-3}$ mm. Calculate Poisson's ratio and the modulus of elasticity.[7]

3. Derive the expressions for total extension for tapered rectangular and circular cross-sectional rods subjected to tensile load P. [10]

4. A straight bar 60 cm long consists of three portions : the first 18 cm length is of 30 mm dia, the middle 26 cm length is of 20 mm dia. and the remaining 16 cm length is of 25 cm dia. if it is subjected to an axial pull of 100 kN find the total extension of the bar. Find also the stresses, strains and changes in length of different portions. Take E = 200 GPa [10]

5. A rectangular plate made of steel is 4 m long and 20 mm thick and is subjected to an axial Tensile load of 40 kN. The width of the plate varies from 30 mm at one end to 80 mm at the Other end. Find the elongation, if E = 2x105 N/mm2. [10]

6.a.Explain in detail about Compound Stresses
b. Explain in detail about Thermal Stresses

UNIT-II

1(a).Describe the different kinds of loads on beams and their end reactions [3]
(b) Define Shear force and bending moment diagram in detail [4]
(c)Draw the B.M diagram of a cantilever beam of span L [3]

2. A simply supported beam of length 10m carries point loads of 4kN, 10kN and 7kN at a distance of 1.5m, 2.5m and 3m respectively from left end A. Draw the S.F. and B.M. diagrams for the simply supported beam [10]

3. A simply supported beam of span 9 m loaded with a varying load of intensity zero at the left hand side and 3 kN/m at the right side. Draw the S.F and B.M diagrams. [12]

4. (a) Derive an expression for bending stress at a layer in a beam. [10]
(b)Derive the bending equation from fundamentals M/I= f/y = E/R

5. (a)Obtain the expression for shearing stress at a section of a loaded beam [4]
(b)Show that the ratio of maximum shear stress to average shear stress is 1.5 in case of a rectangular section (bxd). [6]

UNIT-III

1.(a)Deduce the longitudinal stress for a thin spherical shell subjected to an internal pressure of intensity 'p', with a thickness 't' and diameter 'd'. [4]
(b)Discuss the necessity and mechanics of compound cylinders [4]
(c) Derive the relation for volumetric strain and volume change for a thick spherical shell [4]

2. Derive an expression for circumferential stress and longitudinal stress for a thin shell subjected to an internal pressure. [10]

3. A compound cylinder, formed by shrinking one tube on to another, is subjected to an internal pressure of $80N/mm^2$. Before the fluid is admitted the internal and external diameters of the compound cylinder are 120mm and 200 mm and the diameter at the junction is 160mm. If, after shrinking on, the radial pressure at the common surface is $10N/mm^2$, calculate the final stress set up by the section. [10]

4. A cylindrical shell 3 m long has 1 m internal diameter and 15 mm metal thickness. Calculate the circumferential and longitudinal stresses induced and also changes in the dimensions of the shell, if it is subjected to an internal pressure of 1.5 N/mm^2. Take E = 200 kN/mm^2 and Poisson's ratio = 0. [10]

5. A steel cylinder (thick) of 300 mm external diameter is to be shrunk to another steel cylinder of 150 mm internal diameter. After shrinking the diameter at the junction is 250 mm and radial pressure at the common junction is 28 N/mm^2. Find the original difference in radii at the junction. Take E = $2x10^5$ N/mm^2. [10]

6. Derive the Lames equations from the fundamentals in a thick cylindrical shell for the given radi(r1 and r2) and internal fluid pressure, p. [10]

7. A cylindrical drum 400 mm in diameter has a thickness of 8mm. If the drum is subjected to an internal pressure of 2 $N/mm2$, determine the increase in the volume of the drum. Take young's modulus of elasticity, E=$1.6x10^5N/mm^2$ and poisson's ratio 0.25.
8. A thick spherical shell of 350mm inside diameter is subjected to an internal pressure is $2N/mm^2$.Determine the necessary thickness of the shell, if the permissible stress in the shell material is $2.8N/mm^2$
9.A pipe of 300 mm internal diameter and 60 mm thickness carries a fluid at a pressure of 15 MN/m^2. Calculate the maximum and minimum intensities of circumferential stresses across the section. Also sketch the radial stress distribution and circumferential stress distribution across the section.

MID -II QUESTIONS

UNIT-IV

1. a)Define Steam Boiler and Classify Different types of boilers
b) Write the essentialities of boiler
2. a)explain selection of different types of boilers
b) Explain about boiler mountings and boiler accessories
3. Expalin the working principle of any one Water tube boiler with neat sketch.
4. Explain the working principle of any one Fire tube boiler with neat sketch.
5. a)Explain any two boiler mountings with neat sketch
b) Explain any two boiler accessories with neat sketch.
6. What is a steam turbine .Classify different type of steam turbines?
7. a).Classify and explain different types of Compressors
b) Write the uses of compressed air
8. Explain the working principle of reciprocating compressor with neat sketch
9. What is the work done in single stage and two stage compression?

UNIT-V

1. Explain working principle of 4 stroke petrol engine with neat sketch?
2. Explain working principle of 4 stroke Diesel engine with neat sketch?
3. Explain working principle of 2 stroke petrol engine with neat sketch?
4. Explain working principle of 2 stroke Diesel engine with neat sketch?
5. a) Compare two stroke engines with four stroke engines?
   b) Compare Compression ignition engine with Spark ignition engine?
6. a) What is an I.C engine? Classify different types of engines
   b) Explain the basic engine components and nomenclature?

UNIT-VI

1. Explain in detail about belt and rope drives with neat sketches.
2. Describe the following a)velocity ratio b) slip c) length of the belt d) ratio of friction tensions
3. An engine, running at 150 r.p.m., drives a line shaft by means of a belt. The engine pulley is 750 mm diameter and the pulley on the line shaft being 450 mm. A 900 mm diameter pulley on the line shaft drives a 150 mm diameter pulley keyed to a dynamo shaft. Find the speed of the dynamo shaft, when a) there is no slip, and b) **there** is a slip of 2% at each drive.
4. The power is transmitted from a pulley 1 m diameter running at 200 r.p.m. to a pulley 2.25 m diameter by means of a belt. Find the speed lost by the driven pulley as a result of creep, if the stress on the tight and slack side of the belt is 1.4 MPa and 0.5 MPa respectively. The Young's modulus for the material of the belt is 100 MPa.
5. A shaft which rotates at a constant speed of 160 r.p.m. is connected by belting to a parallel shaft 720 mm apart, which has to run at 60, 80 and 100 r.p.m. The smallest pulley on the driving shaft is 40 mm in radius. Determine the remaining radii of the two stepped pulleys for 1. a crossed belt, and 2. an open belt. Neglect belt thickness and slip.
6. Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN, and the coefficient of friction between the belt and pulley is 0.25?
7. A shaft rotating at 200 r.p.m. drives another shaft at 300 r.p.m. and transmits 6 kW through a belt. The belt is 100 mm wide and 10 mm thick. The distance between the shafts is 4m. The smaller pulley is 0.5 m in diameter. Calculate the stress in the belt, if it is **1.** An open belt drive,
   and **2.** Across belt drive. Take $\mu = 0.3$.
8. a)Explain different types gears
   b) Explain about law of gearing
9. a) Explain different types of gear profiles
   b) Write the applications of the gear
10. a)Explain different types gear trains with neat sketch
    b) Two parallel shafts, about 600 mm apart are to be connected by spur gears. One shaft is to run at 360 r.p.m. and the other at 120 r.p.m. Design the gears, if the circular pitch is to be 25 mm.
11. The speed ratio of the reverted gear train, as shown in Fig. 13.5, is to be 12. The module pitch of gears A and B is 3.125 mm and of gears C and D is 2.5 mm. Calculate the suitable numbers of teeth for the gears. No gear is to have less than 24 teeth
12. A compound train consists of six gears. The number of teeth on the gears are as follows:

Gear: A B C D E F No. of teeth: 60 40 50 25 30 24

The gears B and C are on one shaft while the gears D and E are on another shaft. The gear A drives gear B, gear C drives gear D and gear E drives gear F. If the gear A transmits 1.5 kW at 100 r.p.m. and the gear train has an efficiency of 80 per cent, find the torque on gear F.

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ENGLISH- II QUESTION BANK- I B. TECH (CIVIL, EEE& ECE)

Unit- I

1) **A.** Explain Schumacher views on education?

B. What was the objective of the SLV project?

C. Give the synonyms of the following:

i. Precipitate **ii.** Antecedent

2) **A.** Write a letter to the editor of a leading newspaper on the problem of eve - teasing in your city.

B. Explain the work Kalam did at DRDO.

C. Give Antonyms for the following words:

i. Inferior **ii.** Conceal

3) **A.** What are the arguments which the author put forward to show that education is necessary?

B. Who helped Kalam design the guidance systems for Agni Missile?

C. Give synonyms for following:

i. Apprehension **ii.** Brink

4) **A.** How is positive attitude helpful for the students?

B. Name a few awards that Kalam won.

C. Give antonyms for the following words:

i. Culminate **ii.** Persuade

5) **A.** What should be done to overcome the problems of modern life?

B. Why Abdul Kalam is called the Missile Man of India?

C. Give Antonyms for the following words:

i. Decline **ii.** Civilized

UNIT- II

1) **A.** Who is responsible for the destructive use of scientific inventions- Science or people?

B. What were some of the changes that Raman had initiated at the Indian Institute of Science?

C. Write the superlative adjectives for the following words:

i. Tall **ii.** Bright

2) A. Describe any modern invention with its positive and negative effects on the society.

B. At what age did Raman join the graduation class? Can you remember an interesting anecdote concerning his English teacher?

C. Write the superlative adjectives for the following words:

i. Beautiful **ii.** Sweet

3) A. You are Mr. Deepak, the librarian of KVAFA. Write an email to Rana book depot, Hyderabad requesting them to cancel your order for English literary books and Children's story book. Give reasons for cancellation of the order.

B. Explain the Raman Effect.

C. White synonyms for the following words:

i. Mooting **ii.** Distinguished

4) A. What according to the author is the first reaction of a layman to the bomb on Hiroshima?

B. Where did Raman do his M. A. from? What was his subject?

C. Write superlative adjectives for the following words:

i. Clever **ii.** Hard

5) A. What are views of author on science and its repercussions?

B. Why did Raman resign from his job after 10 year of service? Why did he take a cut in his salary?

C. Fill in the blanks with appropriate words:

i. SLV stands for **ii.** Kalam's first school was

Unit- III

1) A. What is Cultural Shock? Explain.

B. What were the objectives Bhabha wanted to fulfill with the nuclear Programme?

C. Fill in the blank with an appropriate form of the verb given in brackets:

i. The deaf and the blind --- (find) it was very difficult to acquire the amenities of conversation.

ii. She --- (like) coffee compared to tea.

2) A. Prepare a 5 minutes speech expressing your views on the following topic: ***Betting in sports*.**

B. Who was Dirac? What was his major contribution?

C. Fill in the blank with an appropriate form of the verb given in brackets:

i. She --- (play) football every day.

ii. She --- (go) to church every Sunday.

3) A. Write the four stages of cultural shock.

B. Note contributions of Ernest Rutherford.

C. Fill in the blank with an appropriate form of the verb given in brackets:

i. The train --- (have left) before I reached the station.

ii. She --- (lost) the key just now.

4) A. Explain Non - Verbal Communication.

B. What were Bhabha's efforts to set up research institute in India?

C. Fill in the blank with an appropriate form of the verb given in brackets:

i. She --- (see) Delhi many times.

ii. She --- (have work) a lawyer since 2000.

5) A. What is Body Language?

B. What is the message of Bhabha to the youth?

C. Fill in the blank with an appropriate form of the verb given in brackets:

i. Summer------ (come) after winter.

ii. She----- (meet) the principal yesterday.

UNIT- IV

1) A. Write an essay on- "Global Warming"

B. Write the views of the author on J.C. Bose.

C. In questions given below out of four alternatives, choose the one which can be substituted for the given word/sentence:

i. A person who knows many foreign languages

A. Linguist B. Grammarian C. Polyglot D. Bilingual

ii. One who possesses many talents

A. Versatile B. Nubile C. Exceptional D. Gifted

2) A. What seems to have been the original purpose of the lottery? What do people believe about it?

B. What was Bose's attitude towards education as he grew up?

C. In questions given below out of four alternatives, choose the one which can be substituted for the given word/sentence:

i. That which cannot be corrected

A. Unintelligible B. Indelible C. Illegible D. Incorrigible

ii. The study of ancient societies

A. Anthropology B. Archaeology C. History D. Ethnology

3) A. Is it important that the original paraphernalia for the lottery had been lost? What do you suppose the original ceremony was like? Why have some of the villages given up this practice? Why hasn't this one?

B. Why did Bose shift his interest? What were his contributions to the two fields he worked in?

C. In questions given below out of four alternatives, choose the one which can be substituted for the given word/sentence:

i. A person of good understanding knowledge and reasoning power

A. Expert B. Intellectual C. Snob D. Literate

ii. A person who insists on something

A. Disciplinarian B. Stickler C. Instantaneous D. Boaster

4) **A.** Is the lottery a collective act of murder? Is it morally justified? Is tradition sufficient justification for such actions? How would you respond to cultures that are different from ours that perform "strange" rituals?

B. Give an account of Bose's experiments relating to plant responses.

C. In questions given below out of four alternatives, choose the one which can be substituted for the given word/sentence:

i. State in which the few govern the many

A. Monarchy B. Oligarchy C. Plutocracy D. Autocracy

ii. A style in which a writer makes a display of his knowledge

A. Pedantic B. Verbose C. Pompous D. Ornate

5) **A.** Write a newspaper report about an accident that took place on the main road in your town.

B. Explain the childhood and early life of J.C. Bose.

C. In questions given below out of four alternatives, choose the one which can be substituted for the given word/sentence:

i. One who eats everything

A. Omnivorous B. Omniscient C. Irascible D. Insolvent

ii. The custom or practice of having more than one husband at same time

A. Polygyny B. Polyphony C. Polyandry D. Polychromic

UNIT- V

1) **A.** How can we prevent climate change?

B. Explain Assertiveness.

C. Fill the blank with suitable preposition.

i. I have been waiting for you _____ seven o'clock.

ii. I will have finished this essay _____ Friday.

2) **A.** How does climate change affect human health?

B. Explain the early life of Prafulla Chandra Ray.

C. Fill the blank with suitable preposition.

i. Peter is playing tennis _____ Sunday.

ii. What are you doing _____ the afternoon?

3) A. How are morality and excessive heat related?

B. Write an essay on – "Climate Change".

C. Fill the blank with suitable preposition.

i. We are going to see my parents _____ the weekend.

ii. In 1666, a great fire broke out _____ London.

4) A. Write a short note on aeroallergens.

B. What are the contributions and achievements of Prafulla Chandra Ray?

C. Fill the blank with suitable preposition.

i. The shops open _____ nine.

ii. She has never seen the sea _____ winter.

5) A. What is public health surveillance and why is it important?

B. Write an article on- "Air Pollution".

C. Fill the blank with suitable preposition.

i. My brother's birthday is _____ the 5th of November.

ii. My birthday is _____ May.

UNIT- VI

1) A. Why IBM approached Bill Gates? Explain the problems and prospects of their agreement.

B. Who is Srinivasa Ramanujan?

C. Fill the gap with the suitable verb.

i. Neither of the contestants_____ able to win a decisive victory. (was / were)

ii. Oil and water _____ not mix. (do / does)

2) A. What does SMART mean in goal setting?

B. Who is Paul Allen? Write the achievements of Allen with Gates.

C. Fill the gap with the suitable verb.

i. One of my friends _____gone to France. (has / have)

ii. Each of the boys _____ given a present. (was / were)

3) A. What are the advantages of team work?

B. Explain the achievements of Ramanujan at Cambridge.

C. Fill the gap with the suitable verb.

i. Neither Peter nor James _____ any right to the property. (has / have)

ii. No prize or medal _____ given to the boy, though he stood first in the examination. (was / were)

4) **A.** Explain the family details of Bill Gates.

B. Explain the education and research career of Srinivasa Ramanujan?

C. Fill the gap with the suitable verb.

i. He and I _____ at Oxford together. (was / were)

ii. Slow and steady _____the race. (win / wins)

5) **A.** Why did Bill Gates and Allen sue a case against the new owner of MITS?

B. Write a report on- "Blood donation camp".

C. Fill the gap with the suitable verb.

i. Either Mary or Alice …… responsible for this. (is / are)

ii. Neither the Minister nor his colleagues ……given any explanation for this. (have / has)

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Department of Basic Sciences & Humanities

SUBJECT: MATHEMATICAL METHODS **YEAR /SEM : I/II**

NAME OF THE FACULTY:B.CH.K.PREETHI, Asst. Prof.Dept.Of.Mathematics **BRANCHS: EEE/CIVIL**

UNIT-I

1. a) Find the Real root of the equation $x^2 - x - 4 = 0$ using iteration method (5M)

b) Find the Real root of the equation $x^4 - x - 10 = 0$ using Newton Raphson method (5M)

2 (a) Using Newton-Raphson method find the root of the equation $\mathbf{x+\log_{10} x = 3.375}$ correct to four decimal places. (5M)

b) Find the Real root of the equation $3x = e^x$ using Bisection method. (5M)

3 (a) Find the Real root of the equation $x^3 = 2x + 5$ using false position method (5M)

(b)Solve $\mathbf{x^3 - 4x + 1 = 0}$ the equation by Bissection method (5M)

4 (a) Using Newton – Raphson method, find a root of the equation **2x- 3sinx =5** near x=*3* correct to three decimal places. (5M)

(b) Develop an Iterative formula to find $\frac{1}{N}$ using Newton Raphson method (5M)

5(a) Using Regular-Falsi method,find the root of $\boldsymbol{x^3 - x - 2 = 0}$, over (1, 2) (5M)

(b) By using Newton-Raphson method, find the root of $\boldsymbol{x^4 - x - 10 = 0}$, correct to three decimal places. (5M)

UNIT-II

1(a) Using Lagrange's interpolation formulae find the value of y (12) from the data (5M)

x	0	2	3	6
y	648	704	729	792

(b) Determine the value of f(x) at x = 25 for the following data (5M)

x	20	24	28	32
f(x)	24	32	35	40

2 (a) Find $f(142)$ using Newton's forward formula for the following table

x	140	150	160	170	180
Y=f(x)	3.685	4.854	6.302	8.076	10.225

(5M)

(b) Calculate f(3) from the following table. (5M)

X	0	1	2	4	5	6
f(x)	1	14	15	5	6	19

3(a) Given that f(6500) = 80.6223, f(6510) = 80.6846, f(6520) = 80.7456, f(6530) = 80.8084, Find f(6526) using Gauss backward interpolation formula. (5M)

(b) Using gauss forward difference formula, find y(12)from the given table (5M)

x	1	6	11	16	21	26
y	5	10	14	18	24	32

4 (a) Using Gauss Backward difference polynomial, find y(5) given that (5M)

X	2	4	6	8	10
Y	5	11	13	15	17

(b) Use Gauss backward interpolation formula to find f(32) given that
$f(25) = 0.2707$, $f(30) = 0.3027$, $f(35) = 0.3386$, $f(40) = 0.3794$. (5M)

5(a) Prove that $(1 + \Delta)(1 - \nabla) = 1$. (3M)

(b)Compute f(27) using Lagranges formula from the following table

X	14	17	31	35
F(x)	68.7	64	44	39.1

. (6M)

6(a)Prove that (i) $\mu^2 = 1 + \frac{\delta^2}{4}$ (ii) $\delta = E^{\frac{1}{2}} - E^{\frac{-1}{2}}$. (6M)

(b) If the interval of differencing is unity, find $\Delta^2 sin(px + q)$. (4M)

UNIT-III

1(a) Using modified Euler method solve numerically the equation $\frac{dy}{dx} = 2 + \sqrt{xy}$, with y(1)=1 to find y(1.2). (5M)

(b)Using Euler's method, solve for y (0.6) from $\frac{dy}{dx} = -2xy$, $y(0) = 1$ using step size 0.2. (5M)

2(a) Given $\frac{dy}{dx} = x + \sin y$, $y(0) = 1$, compute y(0.2) and y(0.4) using Euler's modified method. (5M) (b) A cu.rve is observed to pass through the points given in the following table 5M

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	2	2.4	2.7	2.8	3	2.6	2.1

By using simpson's rule find the area bounded by the curve and x axis between x=1 and x=4

3(a) $y' = x^2 y + 1, y(0) = 1$ using Taylors method up to 3rd degree term and compute y(0.1)

(5M)

(b) Solve , $y' = y - x^2$ $y(0) = 1$ using Picard's method up to 4th approx. y(0.1).& y(0.2)

(5M)

4(a) Evaluate $\int_0^1 \sqrt{1 + x^4} dx$ by taking h=0.125 using Simpson's 1/3rd & 3/8 th rule , . (5M)

(b) Evaluate $\int_0^{\frac{\pi}{2}} \frac{\cos x}{1+x} dx$ by (i) Trapezoidal rule (ii) Simpson's 3/8th Rule (5M)

5(a) Find y (0.1) using 4th order Runge-Kutta method given that , $y' = x + x^2 y$, $y(0) = 1$. (5M)

(b) Use Runge-Kutta 4th order to compute y(1.2) for the equation $y' = \frac{x^2+y}{x}$, $y(1) = 2$ (5M)

6.. (a) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Simpson's 3/8th rule 5M

(b) Evaluate $\int_0^1 \frac{dx}{1+x}$ by using Trapizoidal rule. 5M

UNIT IV

1. **(a)** Obtain the Fourier series for $f(x) = e^x$ in the interval $0 < x < 2\pi$. 5M
   (b) Find a Fourier series to represent the function f(x) = $x - x^2$ from $x = -\pi \; to \; x = \pi$ 5M

2. (a) Expand $f(x) = x \sin x$ as a Fourier series in the interval $-\pi < x < \pi$. 5M

   And show that $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \frac{1}{7.9} \ldots . = \frac{\pi - 2}{4}$

   (b) Find the Fourier series of $f(x) = \begin{cases} 0 \; , -\pi < x < 0 \\ \frac{\pi}{4} \; , \; 0 < x < \pi \end{cases}$ 5M

3. (a) Obtain the Fourier series to represent $f(x) = \frac{1}{4}(\pi - x^2) \, , 0 < x < 2\pi$. 5M

   (b) Find the Fourier series of the periodic function defined as $f(x) = \begin{cases} -\pi \; , & -\pi < x < 0 \\ x \; , & 0 < x < \pi \end{cases}$

   Hence , deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots = \frac{\pi^2}{8}$ 5M

4. (a) Find half range cosine series of the function $f(x) = e^x \; in [0,1]$ 5M

   (b) Find the half range sine series of $f(x) = \begin{cases} \frac{\pi}{2} \; , & 0 < x < \frac{\pi}{2} \\ \pi - x \; , & \frac{\pi}{2} < x < \pi \end{cases}$ 5M

5. (a) Find the Fourier series of the function $f(x) = \begin{cases} 0 \; , & 0 < x < 1 \\ x^2 \; , & 1 < x < 2 \end{cases}$ 5M

   (b) Find Fourier cosine series for $f(x) = x(x - 2) \, , \; in \; 0 \le x \le 2$ and hence find the sum of the series

   $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \cdots$ 5M

6. (a) Find the Fourier series of periodicity 2 for $f(x) = x + x^2 \, , \; in \; 0 < x < 2$ 5M

   (b) Find the half range cosine series of $f(x) = \begin{cases} 1, & 0 < x < \frac{\pi}{2} \\ -1, & \frac{\pi}{2} < x < \pi \end{cases}$ 5M

UNIT -V

1. (a) Using the method of separation of variables, solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u \; where \; u(x,0) = \; 6\, e^{-3x}$.5M

   (b) Using the method of separation of variables, solve

   $$4\,\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u, given\ that\ u(0,y) = \; 3\, e^{-y} - e^{-5y}$$ 5M

2. A tightly stretched string with fixed end points x=(0) and x=$(l)$is initially in a position given by

   $y = \; y_0\, sin^3\, \left(\frac{\pi x}{l}\right)$. If it is released from this position, find the displacement y(x, t). 10M

3. Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ $with\ boundary\ conditions \;\; u(x\,,0) = 3\sin(n\pi x)\,, u(0\,,t) = 0\ and \;\; u(l\,,t) = 0, where\ 0 < x < l\,, t > 0.$ 10M

4. Solve the laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to the conditions $u(0\,,\; y) = \; u(l\,,\; y) = \; u(x\,,0) = 0\ and\ u(x\,, a) = sin(n\pi x/l).$ 10M

6. Find the solution of the wave equation $\frac{\partial^2 u}{\partial t^2} = a^2\, \frac{\partial^2 u}{\partial x^2}$, if the intial defiection is

   $$f(x) = \begin{cases} \frac{2k}{l}\, x \;\; , \;\; if \;\; 0 < x < \frac{l}{2} \\ \frac{2k}{l}\, (l - x) \;\; , \;\; if \;\; \frac{l}{2} < x < l \end{cases}$$ and intial velocity equal to 0. 10M

UNIT VI

1. (a) Using Fourier integral , Show that $\int_0^\infty \frac{\cos \lambda x}{\lambda^2+a^2}\, d\tau = \frac{\pi}{2a}\, e^{-ax}$, $a > 0$, $x \geq 0$. 5M

   (b) Find the Fourier transform of $f(x) = \begin{cases} x & , if \ |x| \leq 1 \\ 0 & , if \ |x| > 1 \end{cases}$ 5M

2. (a) Find the Fourier transform of $\frac{1}{\sqrt{|x|}}$ 5M

   (b) Find the Fourier sine transform of $e^{-|x|}$. 5M

3. (a)If $F(p) or F(s)$ is the complex fourier transform of f(x) then the complex fourier transform of

   Then find the complex fourrier transform of f(x)= $\cos ax$ 5M

   (b) Find the Fourier sine and cosine transforms of $2e^{-5x} + 5e^{-2x}$ 5M

4. (a) Find the Fourier sine transform of $f(x) = e^{-ax}$, $a > 0$ and deduce the inversion formula.5M
   (b) Find the inverse Fourier sine transform of $f(x)\ of$ $F_s(p) = \frac{p}{1+p^2}$. 5M

5. (a) Find the Fourier Cosine transform of $\frac{e^{-ax}}{x}$ 5M

   (b) Find the inverse Fourier sine transform $f(x)\ of$ $F_s(p) = \frac{e^{-ap}}{p}$; and show that $F_s^{-1}(1/p) = 1$. 5M

6. (a) Prove that $F[x^n\, f(x)] = (-i)^n \frac{d^n}{dp^n}[F(p)]$. 5M

   (b) Prove that $F\left[\frac{d^n}{dx^n} f(x)\right] = (-ip)^n F(p). where\ F[f(x)] = F(p)$. 5M

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I B.TECH IISem Question Bank

Subject : Mathematics-III Branch: ECE, EEE,Civil. (2018-2019)

Faculty: Dr.Ch.Prabhakara Rao.

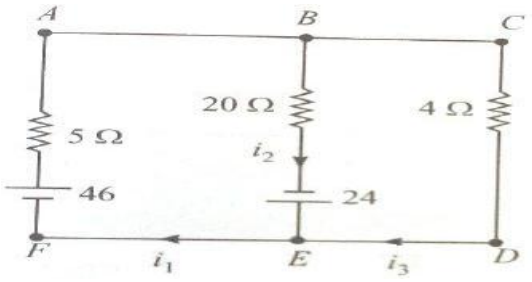
UNIT -I

1(a) Solve the system of equations $20x + y - 2z = 17, 3x + 20y - z = -18, 2x - 3y + 20z = 25$ by Gauss Jacobi method 5M

(b) Reduce the matrix A to normal form and hence find the rank of the matrix

$$A = \begin{bmatrix} 2 & -2 & 0 & 6 \\ 4 & 2 & 0 & 2 \\ 1 & -1 & 1 & 2 \end{bmatrix}$$ 5M

2(a) Find the currents in the following circuits 5M



(b) solve the system of equations $10x + y + z = 12$, $2x + 10y + z = 13$ and $2x + 2y + 10z = 14$ using Gauss-seidel method. 5M

3(a) Find the non singular matrices P and Q such that the normal form of A is PAQ where $A = \begin{bmatrix} 1 & 3 & 6 & -1 \\ 1 & 4 & 5 & 1 \\ 1 & 5 & 4 & 3 \end{bmatrix}$. Hence find its rank. 5M

(b) Find the rank of $\begin{pmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{pmatrix}$ after reducing it to Echelon form 5M

4(a) Find the values of 'a' and 'b' for which equation $x + y + z = 3$; $x + 2y + 2z = 6; x + ay + 3z = b$ have unique solutions. 5M

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(b) using Gauss-jordan method solve the system of equations $2x + y + z = 10,\ 3x + 2y + 3z = 18,\ x + 4y + 9z = 16$. 5M

5(a) Reduce the matrix A to normal form and hence find the rank of the matrix. 5M

$$A = \begin{bmatrix} 2 & 1 & 3 & 4 \\ 0 & 3 & 4 & 1 \\ 2 & 3 & 7 & 5 \end{bmatrix}$$

(b) prove that the following set of equations are consistent and solve them.

$2x - y - z = 2\ ; x + 2y + z = 2\ ; 4x - 7y - 5z = 2\ ;.$

UNIT – II:

1(a) Find Eigen values and Eigen vectors of $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ 5M

(b) Reduce the quadratic form $10x^2 + 2y^2 + 5z^2 - 4xy - 10xz + 6yz$ into canonical form and find the nature, rank, index and signature. 5M

2(a)Reduce the Quadratic form $3{x_1}^2 + 3{x_2}^2 + 3{x_3}^2 + 2x_1x_2 + 2x_1x_3 - 2x_2x_3$ into sum of squares form by an orthogonal transformation and give the matrix transformation. 5M

(b)Find A^{-1} using Cayley –Hamilton theorem, where $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$ 5M

3(a) what is the nature of the quadratic form $X^T AX$, if $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ 5M

(b)Prove that if τ is an Eigen value of a matrix A then τ^{-1} is an Eigen value of matrix A^{-1} if it exists. 5M

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I B.TECH IISem Question Bank

Subject : Mathematics-III Branch: ECE, EEE,Civil. (2018-2019)

Faculty: Dr.Ch.Prabhakara Rao.

4(a) If τ is an Eigen value of a non singular matrix A then show that $\frac{|A|}{\tau}$ is an Eigen value of matrix adjoint A(adjA) 5M

(b) Find A^{-1} using Cayley –Hamilton theorem, where $A = \begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ 5M

5(a) state Cayley-Hamilton theorem and find A^8 if $A = \begin{pmatrix} 1 & 2 \\ 2 & -1 \end{pmatrix}$ 5M

(b) Diagonalize the matrix $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ -1 & 2 & 2 \end{bmatrix}$ 5M

6(a) Show that if λ is an eigen value of A, then prove that the eigen value of

$B = a_0A^2+a_1A + a_2I$ is $a_0\,\lambda^{\mathbf{2}} + \boldsymbol{a_1}\,\lambda + \boldsymbol{a_2}$. **5M**

(b) Is the matrix $\begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 2 & 5 & 7 \end{bmatrix}$ diagonalizable ? 5M

UNIT –III :

1(a) Evaluate $\int_{y=0}^{2}\int_{x=0}^{3} xy \;\; dxdy$ 5M

(b) Evaluate $\int_0^a \int_{\frac{x^2}{a}}^{2a-x} xy^2 dydx$ by changing the order of integration. 5M

2(a Evaluate $\int_{x=0}^{a}\int_{y=0}^{b}(x^2+y^2)dydx$ 5M

(b) By changing the order of integration , evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2 dxdy$ 5M

3(a) Find the moment of inertia about the initial line of the cardioid $r = a(1-cos\theta)$. 5M

(b) Evaluate $\iiint dx\, dy\, dz$ V is the finite region of space formed by the planes

$x = y = z = 0$ and $2x + 3y + 4z = 12$ 5M

4(a) Evaluate $\int_0^{\frac{\pi}{2}}\int_0^{asin\theta} \int_0^{\frac{a^2-r^2}{2}} r\, dz\; dr\, d\theta$. 5M

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(b) Evaluate $\int_0^4 \int_{\frac{y^2}{4}}^{y} \frac{y}{x^2+y^2}\, dx\, dy$ 5M

5(a) Evaluate $\int_0^a \int_x^a (x^2 + y^2) dy dx$ by changing the order of integration. 5M

(b) Evaluate $\iint (x^2 + y^2) dx dy$ in the positive quadrant for which $x + y \leq 1$. 5M

UNIT – IV:

1(a) Show that $\int_0^\infty \sqrt{x} e^{-x^3} dx = \frac{\sqrt{\pi}}{3}$ 5M

(b) Show that $\int_0^\infty \frac{x^{m-1}}{(a+bx)^{m+n}} dx = \frac{\beta(m,n)}{a^n b^m}$ 5M

2(a) Prove that $\Gamma(n)\Gamma(n-1) = \frac{\pi}{sinn\pi}$ 5M

(b)Prove that $\int_0^{\frac{\pi}{2}} \sqrt{\cos x}\ dx\ \int_0^{\frac{\pi}{2}} \frac{dx}{\sqrt{\cos x}} = \pi$ 5M

3(a) Evaluate $\int_0^1 \frac{x^4(1+x^5)}{(1+x)^{15}}\ dx$ 5M

(b) Evaluate $\int_5^7 (x-5)^6 (7-x)^3\, dx$ using β and Γ functions. 5M

4(a) Show that $\Gamma(\frac{1}{2}) = \sqrt{\pi}$ 5M

(b) Show that $B(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ where m > 0,n > 0. 5M

5(a) Evaluate $\int_0^{\pi/2} sin^5\theta cos^{7/2}\theta d\theta$. 5M

(b) Evaluate $\int_0^1 x^4 \left(log\frac{1}{x}\right)^3 dx$ 5M

6(a) Evaluate $\int_0^1 \frac{xdx}{\sqrt{1-x^5}}$. 5M

(b) Evaluate $\int_0^\infty x^2 e^{-x^2}\, dx$. 5M

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UNIT- V :

1(a) Find unit normal vector to the surfaces $x^2y + 2xz^2 = 8$ at the point (1,0,2) 5M

(b) Prove that $div.(gradr^m) = m(m+1)r^{m-2}$ 5M

2(a)Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at the point (2, -1 , 2). 5M

(b) If $\bar{A}$ is irrotational , evaluate $div(\bar{A} \times \bar{r})$ where $\bar{r} = x\bar{\imath} + y\bar{\jmath} + z\bar{k}$ 5M

3(a) Find $div\bar{F}$, where $\bar{F} = r^n\bar{r}$. Find n if it is solenoidal. 5M

(b) Show that $\overline{F} = (y^2 - z^2 + 3yz - 2x)\bar{\imath} + (3xz + 2xy)\bar{\jmath} + (3xy - 2xzy + 2z)\bar{k}$ is both irrotational and Solenoidal . 5M

4(a) Find the directional derivative of $\emptyset = x^2yz + 4xz^2$ at (1,-2,-1) in the direction of $2\overline{i} - \overline{j} - 2\overline{k}$ 5M

(b) Show that the vector $(x^2 - yz)\bar{\imath} + (y^2 - zx)\bar{\jmath} + (z^2 - xy)\bar{k}$ is irrotational and find its scalar potential. 5M

5(a) Show that $\nabla^2(f(r)) = \frac{d^2f}{dr^2} + \frac{2}{r}\frac{df}{dr}$ or $f^{II}(r) + \frac{2}{r}f^{I}(r) where\, r = |\,\overline{r}\,|$. 5M

(b) Prove that $div(\bar{a} \times \bar{b}) = \bar{b}.curl\bar{a} - \overline{a}.curl\bar{b}$ 5M

UNIT – VI

1(a) Use Greens theorem to evaluate $\int(2xy - x^2)dx + (x^2 + y^2)$dy , where c is theclosed curve of the region bounded by $y = x^2\ and\ y^2 = x$. 5M

(b) State Gauss divergence theorem and verify $\bar{F} = 4xz\bar{\imath} - y^2\bar{\jmath} + zy\bar{k}$ over the cube $x = 0\ \&\ x = 1, y = 0\ \&\ y = 1, z = 0\ \&\ z = 1$. 5M

2(a) Evaluate $\int(e^x dx + 2ydy - dz)$ where c is the curve is the curve $x^2 + y^2 = 9$, $z = 2$, by using Stoke's theorem. 5M

(b) Compute $\int(ax^2 + by^2 + cz^2)ds$ over the surface of the sphere $x^2 + y^2 + z^2 = 1$. 5M

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3(a) If $\bar{F} = (3x^2 + 6y)\vec{\imath} - 14yz\vec{\jmath} + 20xz\vec{k}$ then evaluate $\int \bar{F}.\overrightarrow{dr}$ from (0,0,0) to (1,1,1) along $x = t\ , y = t^2, z = t^3$. 5M

(b) Apply stoke's theorem to evaluate $\int(ydx + zdy + xdz)$ where c is the curve of intersection of the sphere $x^2 + y^2 + z^2 = a^2 and\ x + z = a.$ 5M

4(a) State stoke's theorem,and verify for $\bar{F} = (x + y)\vec{\imath} + (y + z)\vec{\jmath} - x\vec{k}$ and S is the Surface of the plan $2x + y + z = 2$ which is in the first octant . 5M

(b) Using divergence theorem to evaluate $\iint \bar{F}.\overline{ds}$ where $\bar{F} = x^3i + y^3j + z^3k$ and S is surface of the sphere $x^2 + y^2 + z^2 = r^2$. 5M

5(a)Verify Green's theorem in the plan for $\int(x^2 - xy^3)dx + (y^2 - 2xy)dy$ where C is the square with vertices $(0,0), (2,0), (2,2), (0,2)$ 5M

(b) Evaluate by Green's theorem $\oint(y - sinx)dx + cosx\ dy$ where C is the triangle enclosed by the lines y = 0, x = $\frac{\pi}{2}$, πy = 2x. 5M