

CBCS Scheme

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15MAT11

First Semester B.E. Degree Examination, June/July 2016 Engineering Mathematics – I

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions,
choosing ONE full question from each module.

Module-1

- 1 a. Find the n^{th} derivative of $y = e^{-3x} \cos^3 x$. (06 Marks)
- b. Find the angle of intersection between the curves $r = a(1 + \sin \theta)$ and $r = a(1 - \cos \theta)$. (05 Marks)
- c. Find the radius of curvature at the point $\left(\frac{3a}{2}, \frac{3a}{2}\right)$ on the curve $x^3 + y^3 = 3axy$. (05 Marks)

OR

- 2 a. If $y = \sin(\log(x^2 + 2x + 1))$, prove that $(x + 1)^2 y_{n+2} + (2n + 1)(x + 1)y_{n+1} + (n^2 + 4)y_n = 0$. (06 Marks)
- b. Find the pedal equation for the curve $r^m \cos m\theta = a^m$. (05 Marks)
- c. Find the radius of curvature of the curve $x^4 + y^4 = 2$ at the point $(1, 1)$. (05 Marks)

Module-2

- 3 a. Expand $\sin x$ in powers of $x - \frac{\pi}{2}$ upto 4th degree terms using Taylor's series. (05 Marks)
- b. Evaluate: $\lim_{x \rightarrow 0} \left(\frac{\tan x}{x}\right)^{\frac{1}{x^2}}$. (05 Marks)
- c. If $u = \tan^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$ prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{2} \sin 2u$. (06 Marks)

OR

- 4 a. Expand $\log(1 + e^x)$ using Maclaurin's series upto 3rd degree terms. (06 Marks)
- b. If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$ then prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 0$. (05 Marks)
- c. If $x = r \sin \theta \cos \phi$, $y = r \sin \theta \sin \phi$, $z = r \cos \theta$, find $J\left(\frac{x, y, z}{r, \theta, \phi}\right)$. (05 Marks)

Module-3

- 5 a. A particle moves along the curve $x = 2t^2$, $y = t^2 - 4t$, $z = 3t - 5$, where t is the time, find the component of its velocity and acceleration in the direction of the vector $i - 3j + 2k$ at $t = 1$. (06 Marks)
- b. Show that $\vec{F} = (6xy + z^3)i + (3x^2 - z)j + (3xz^2 - y)k$ is irrotational, find ϕ such that $F = \nabla\phi$. (05 Marks)
- c. Prove that $\text{div}(\text{curl } u) = 0$. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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OR

- 6 a. If $\vec{r} = x_i + y_j + z_k$, then prove that : i) $\nabla \times \vec{r} = 0$ ii) $\nabla^2 r^n = n(n+1)r^{n-2}$. (06 Marks)
- b. Prove with usual notations $\text{Curl}(\text{grad } \phi) = 0$ (05 Marks)
- c. Find $\text{div } \vec{f}$ and $\text{curl } \vec{f}$ of $\vec{f} = \text{grad}(x^3 + y^3 + z^3 - 3xyz)$. (05 Marks)

Module-4

- 7 a. Obtain the reduction formula of $\int \sin^m x \cos^n x \, dx$. (06 Marks)
- b. Solve $(x^2 + y^3 + 6x) \, dx + y^2 x \, dy = 0$. (05 Marks)
- c. Find the orthogonal trajectory of $r^n = a^n \cos n\theta$, where a is the parameter. (05 Marks)

OR

- 8 a. Obtain the reduction formula of $\int \cos^n x \, dx$ and hence evaluate $\int_0^{\pi/2} \cos^n x \, dx$. (06 Marks)
- b. Solve $\frac{dy}{dx} = xy^3 - xy$. (05 Marks)
- c. If the temperature of the air is 30°C and the substance cools from 100°C to 70°C in 15 minutes, find when the temperature reaches at 40°C . (Use Newton's law of cooling). (05 Marks)

Module-5

- 9 a. Find the rank of the matrix
- $$A = \begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$$
- (06 Marks)
- b. Find the largest eigen value and the corresponding eigen vector of the matrix
- $$A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$$
- by power method, use
- $[1, 0, 0]^T$
- as initial vector, take five iterations. (05 Marks)
- c. Reduce the matrix $A = \begin{bmatrix} -19 & 7 \\ -42 & 16 \end{bmatrix}$ to the diagonal form. (05 Marks)

OR

- 10 a. Use Gauss – Siedel iteration method upto 3 iterations to solve with $(0, 0, 0)$ as initial values
- $$\begin{aligned} 10x + y + z &= 12 \\ x + 10y + z &= 12 \\ x + y + 10z &= 12. \end{aligned}$$
- (06 Marks)
- b. Show that the transformation :
- $$\begin{aligned} y_1 &= 2x_1 + x_2 + x_3 \\ y_2 &= x_1 + x_2 + 2x_3 \\ y_3 &= x_1 - 2x_3 \end{aligned}$$
- is regular. Write down the inverse transformation. (05 Marks)
- c. Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to the canonical form. (05 Marks)

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15CHE12/22

First/Second Semester B.E. Degree Examination, June/July 2016 Engineering Chemistry

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Explain the construction and working of silver-silver chloride electrode. (05 Marks)
- b. What are ion selective electrodes? Discuss the construction and working of a glass electrode. (06 Marks)
- c. Explain the construction and working of Zinc-Air cell. (05 Marks)

OR

- 2 a. Derive Nerst expression for single electrode potential. (05 Marks)
- b. Explain the following battery characteristics ;
 - i) Energy efficiency
 - ii) Shelf life
 - iii) Cycle life(06 Marks)
- c. Explain the construction and working of Methanol - Oxygen fuel cell with H_2SO_4 electrolyte. (05 Marks)

Module-2

- 3 a. Explain electrochemical theory of corrosion with an example. (05 Marks)
- b. Discuss the differential metal corrosion with an example. (05 Marks)
- c. What is electroless plating? Mention the differences between electroplating and electroless plating. (06 Marks)

OR

- 4 a. Discuss the following factors influencing nature of electrodeposit.
 - i) Brighteners
 - ii) Levellers and
 - iii) pH(06 Marks)
- b. Explain electroplating of Decorative chromium. (05 Marks)
- c. Discuss the process of Galvanization of Iron sheet. (05 Marks)

Module-3

- 5 a. How Calorific value of a solid fuel is determined using bomb calorimeter? (05 Marks)
- b. What is meant by cracking? Describe with a neat diagram, fluidized bed cracking method. (06 Marks)
- c. Explain the construction and working of a photovoltaic cell. (05 Marks)

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OR

- 6 a. 0.75g of coal containing 2% hydrogen, when burnt in a bomb calorimeter, increased the temperature of 2.7kg water from 27.2°C to 29.7°C. If the water equivalent of calorimeter is 1.2kg. Calculate gross and net calorific value (specific heat of water 4.187kJ/kg/°C, latent heat of steam 2457 kJ/kg). (06 Marks)
- b. Explain production of solar grade silicon by union carbide process. (05 Marks)
- c. Discuss the zone refining process of purification of silicon. (05 Marks)

Module-4

- 7 a. Explain free radical mechanism of addition polymerization of vinyl chloride. (05 Marks)
- b. Give the synthesis and applications of the following polymers ;
- i) PMMA (06 Marks)
- ii) Polycarbonate. (05 Marks)
- c. What are polymer composites? Explain synthesis, properties and applications of Kevlar. (05 Marks)

OR

- 8 a. A polymer sample contains 200 molecules of molecular mass 2000, 300 molecules of molecular mass 3000 and 500 molecules of molecular mass 5000. Calculate number average and weight average molecular masses of the polymer. (06 Marks)
- b. What is glass transition temperature? Explain any THREE factors that influence the glass transition temperature. (05 Marks)
- c. What are conducting polymers? Give the mechanism of conduction in polyaniline and two applications. (05 Marks)

Module-5

- 9 a. Explain the scale and sludge formation in boiler. (06 Marks)
- b. What is desalination? Explain reverse osmosis process of desalination of sea water. (05 Marks)
- c. Explain synthesis of nano-material by sol-gel process. (05 Marks)

OR

- 10 a. Define COD. Calculate COD of 25CC of an effluent sample which requires 8.3CC of 0.001M $K_2Cr_2O_7$ for its complete oxidation. (05 Marks)
- b. Explain treatment of sewage by activated sludge process. (06 Marks)
- c. Explain synthesis of nano materials by precipitation method. (05 Marks)

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15PHY12/22

First/Second Semester B.E. Degree Examination, June/July 2016 Engineering Physics

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer any FIVE full questions, choosing one full question from each module.**
2. Physical Constants: Planck's constant $h = 6.63 \times 10^{-34}$ JS, Mass of electron $m = 9.11 \times 10^{-31}$ kg, Boltzmann constant $K = 1.38 \times 10^{-23}$ JK⁻¹, Avogadro number $N_A = 6.025 \times 10^{26}$ /K mol, Velocity of light $C = 3 \times 10^8$ ms⁻¹.

Module-1

- 1 a. Mention the assumptions of Planck's law. Arrive at the relation for Wien's law from Planck's law. (06 Marks)
- b. State Heisenberg's uncertainty principle. Show that electrons cannot exist inside the nucleus. (06 Marks)
- c. Calculate the deBroglie wavelength associated with neutron of mass 1.674×10^{-27} kg with one tenth part of the velocity of light. (04 Marks)

OR

- 2 a. What is phase velocity and group velocity? Show that group velocity is equal to particle velocity. (06 Marks)
- b. Obtain normalized wave function, with respect to a particle inside an one dimensional potential well. (06 Marks)
- c. An electron is bound in one dimensional potential well of width 0.18 nm. Find the energy value in eV of the second excited state. (04 Marks)

Module-2

- 3 a. Explain the failure of classical free electron theory. (06 Marks)
- b. State law of mass action and derive the expression for electrical conductivity of a semiconductor. (06 Marks)
- c. A superconducting tin has a critical field of 306 gauss at 0 K and 217 gauss at 2 K. Find the critical temperature of superconducting tin. (04 Marks)

OR

- 4 a. What is Fermi factor? Discuss the variation of fermifactor with temperature. (06 Marks)
- b. Write a note on High temperature super conductors. (06 Marks)
- c. Calculate the mobility of electrons in copper assuming that each atom contribute one free electron for conduction. Resistivity of copper = 1.7×10^{-8} Ω m, atomic weight = 63.54, density = 8.96×10^3 kg/m³. (04 Marks)

Module-3

- 5 a. Explain the construction and working of semiconductor laser. (06 Marks)
- b. Discuss the three different types of optical fibres. (06 Marks)
- c. The ratio of population of two energy levels out of which one corresponds to metastable state is 1.059×10^{-30} . Find the wavelength of light emitted at 330 K. (04 Marks)

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OR

- 6 a. Describe the recording and reconstruction process in holography with the help of suitable diagrams. (06 Marks)
- b. What is attenuation? Explain the factors contributing to the fibre loss. (06 Marks)
- c. The refractive indices of the core and cladding of a step-index optical fibre are 1.45 and 1.40 respectively and its core diameter is 45 μm . Calculate its fractional refractive index change and numerical aperture. (04 Marks)

Module-4

- 7 a. Define unit cell. Derive the expression for the interplanar spacing in terms of Miller indices. (06 Marks)
- b. Calculate the glancing angle for incidence of X-rays of wave length 0.058 nm on the plane (1 3 2) of NaCl which results in 2nd order diffraction maxima taking the lattice spacing as 3.81 \AA . (06 Marks)
- c. Calculate the atomic packing factor for SC, bCC and fCC. (04 Marks)

OR

- 8 a. Describe the construction and working of a Bragg's X-ray spectrometer. (06 Marks)
- b. Explain the crystal structure of diamond with neat sketch and calculate its atomic packing factor. (06 Marks)
- c. Monochromatic X-rays of wavelength 0.82 \AA undergo first order Bragg reflection from a crystal of cubic lattice with lattice constant 3 \AA at a glancing angle of 7.855°. Identify the possible planes which give rise to this reflection in terms of their Miller indices. (04 Marks)

Module-5

- 9 a. What is Mach number? Define subsonic and supersonic with Mach number and give example. (06 Marks)
- b. Describe the synthesis of carbon nanotubes using Pyrolysis method. (06 Marks)
- c. In a Reddy tube experiment, it was found that, the time taken to travel between the two sensors is 195 μs . If the distance between the two sensors is 100 mm, find the Mach number. (04 Marks)

OR

- 10 a. Describe the construction and working of Reddy's shock tube. (06 Marks)
- b. Explain the structure of carbon nanotube. (06 Marks)
- c. Calculate the wavelength of an electron accelerated under a potential difference of 100 V in scanning electron microscope. (04 Marks)

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15PCD13/23

First/Second Semester B.E. Degree Examination, June/July 2016 Programming in C and Data Structures

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Define Pseudo code. Write a Pseudo code to find sum and average of given three numbers. (05 Marks)
- b. What is an identifier? What are the rules to construct identifier? Classify the following as Valid/Invalid Identifiers.
i) num2 ii) \$num1 iii) +add iv) a_2 (06 Marks)
- c. Write a C program to find area of rectangle. (05 Marks)

OR

- 2 a. Explain printf and scanf functions with example. (04 Marks)
- b. List all the operators used in C. Give examples. (03 Marks)
- c. Write the output of the following C code

```
i) void main ()  
{  
    int a = 5, b = 2, res1 ;  
    float f1 = 5.0, f2 = 2.0, res2 ;  
    res1 = 5/2.0 + a/2 + a/b ;  
    res2 = f1/2 * f1 - f2 ;  
    printf ("res1 = %d res2 = %f", res1, res2) ;  
}
```

```
ii) void main ()  
{  
    int i = 5, j = 6, m, n ;  
    m = i + j ;  
    n = i - j ;  
    printf ("m = %d n = %d", m, n) ;  
}
```

(04 Marks)

Module-2

- a. List all the conditional control statements used in C. Write a C program to find the biggest of three numbers. (08 Marks)
- b. Write a C program to find the reverse of an integer number NUM and check whether it is PALINDROME or NOT. (08 Marks)

OR

- 4 a. Explain the switch statement with syntax and example. (08 Marks)
- b. List the differences between the while loop and do - while loop. Write a C program to find sum of Natural numbers from 1 to N using for loop. (08 Marks)

Module-3

- 5 a. What is an array? Explain the declaration and initialization of single and double dimensional arrays with example. (08 Marks)
- b. Write a C program to search a name in a list of names using Binary searching technique. (08 Marks)

OR

- 6 a. Explain any Five string manipulation library functions with example. (08 Marks)
- b. Write a C program to read N elements and find biggest element in the array. (08 Marks)

Module-4

- 7 a. What is structure? Explain the syntax of structure declaration and initialization with example. (05 Marks)
- b. Write a C program to maintain a record of 'n' employee detail using an array of structures with three fields (id, name, salary) and print the details of employees whose salary is above 5000. (07 Marks)
- c. Explain fprintf and fscanf functions with syntax. (04 Marks)

OR

- 8 a. Explain structure with in a structure with an example. (07 Marks)
- b. What is a file? Explain fopen and fclose functions. (05 Marks)
- c. Explain fgets and fputs functions. (04 Marks)

Module-5

- 9 a. What is a pointer? Explain how the pointer variable is declared and initialized. (04 Marks)
- b. Explain any two preprocessor directives in C with example. (06 Marks)
- c. Write a C program to swap two numbers using call by pointers (address) method. (06 Marks)

OR

- 10 a. What is dynamic memory allocation? Write and explain the different dynamic memory allocation functions in C. (06 Marks)
- b. Explain stack and Queue data structures along with their applications. (06 Marks)
- c. Explain how pointers and arrays are related with example. (04 Marks)

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15ELE15/25

First/Second Semester B.E. Degree Examination, June/July 2016 Basic Electrical Engineering

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. State and explain Kirchoff's laws. (05 Marks)
- b. Find the currents in the various branches of the given network shown in Fig. Q1 (b). (06 Marks)

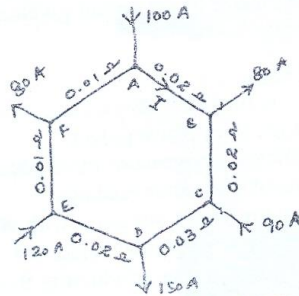


Fig. Q1 (b)

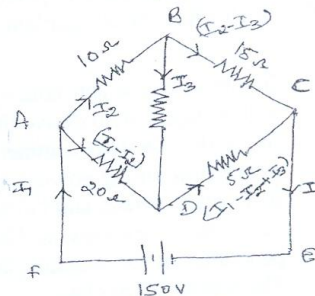


Fig. Q2 (b)

- c. Define the co-efficient of coupling and find its relation with L_1 , L_2 and M . (05 Marks)

OR

- 2 a. State ohm's law and mention its limitations. (05 Marks)
- b. In the network shown in Fig. Q2 (b), find the currents flowing in each branch using Kirchoff's laws. (06 Marks)
- c. Define mutual inductance and explain with respect to two coils placed very close to each other. (05 Marks)

Module-2

- 3 a. With a neat sketch, explain the construction of the various parts of a D.C. generator. (05 Marks)
 - b. What is the significance of back EMF in a D.C. motor? (05 Marks)
 - c. With a neat figure, explain the construction and working principle of a dynamometer type wattmeter. (06 Marks)
- OR
- 4 a. Derive the EMF equation of a D.C. generator. (05 Marks)
 - b. Derive an equation for the torque developed in the armature of a D.C. motor. (05 Marks)
 - c. With a neat figure, explain the construction and working principle of an induction type single phase energy meter. (06 Marks)

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Module-3

- 5 a. Derive an expression for average value of an alternating quantity. (05 Marks)
 b. A circuit consists of a resistance of 10Ω , an inductance of 16 mH and a capacitance of $150 \mu\text{F}$ connected in series. A supply of 100 V at 50 Hz is given to the circuit. Find the current, pf and power consumed by the circuit. Draw the vector diagram. (06 Marks)

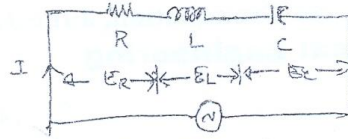


Fig. Q5 (b)

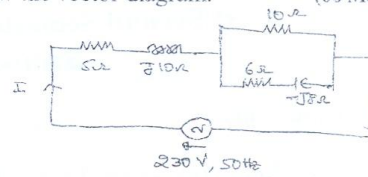


Fig. Q6 (b)

- c. With a circuit diagram, explain the working of a three way control of lamp. (05 Marks)

OR

- 6 a. Define RMS value of a sinusoidally varying current and find its relation with its maximum value. (05 Marks)
 b. Find the total current, power and power factor of the circuit given in Fig. Q6 (b). (05 Marks)
 c. With a neat figure, explain plate earthing. (06 Marks)

Module-4

- 7 a. In a three phase star connection, find the relation between line and phase values of currents and voltages. Also derive the equation for three phase power. (05 Marks)
 b. Show that the two wattmeters are sufficient to measure three phase power. Also derive an expression for the power factor in terms of wattmeter readings. (06 Marks)
 c. A 6 pole, 3 phase, star connected alternator has an armature with 90 slots and 12 conductors per slot. It revolves at 1000 rpm , the flux per pole being 0.5 web . Calculate the emf generated, if the winding factor is 0.97 and all the conductors in each phase are in series. The coil is full pitched. (05 Marks)

OR

- 8 a. In a 3 phase delta connection, find the relation between line and phase values of currents and voltages. Also derive an equation for three phase power. (05 Marks)
 b. Explain the effect of power factor on the two wattmeter readings connected to measure three phase power. (06 Marks)
 c. A 6 pole, 3 phase, 50 Hz alternator has 12 slots per pole and 4 conductors per slot. The winding is $5/6$ full pitched. A flux of 25 mWb is sinusoidally distributed along the air gap. Determine the line emf, if the alternator is star connected. (05 Marks)

Module-5

- 9 a. Derive the EMF equation of a transformer. (05 Marks)
 b. Find the number of turns on the primary and secondary side of a $440/230 \text{ V}$, 50 Hz single phase transformer, if the net area of cross section of the core is 30 cm^2 and the flux density is 1 Wb/m^2 . (06 Marks)
 c. Define the slip of an induction motor and derive the relation between the supply frequency and rotor current frequency. (05 Marks)

OR

- 10 a. Explain the different losses occurring in a transformer. (05 Marks)
 b. A single phase, 20 KVA transformer has 1000 primary turns and 2500 secondary turns. The net cross sectional area of the core is 100 cm^2 . When the primary winding is connected to 550 V , 50 Hz supply, calculate (i) the maximum value of the flux density in the core, (ii) The voltage induced in the secondary winding and (iii) the primary and secondary full load currents. (06 Marks)
 c. With a circuit diagram, explain the working of a star-delta starter for a three phase induction motor. (05 Marks)

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CBCS Scheme

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First/Second Semester B.E. Degree Examination, June/July 2016 Basic Electronics

Time: 3 hrs.

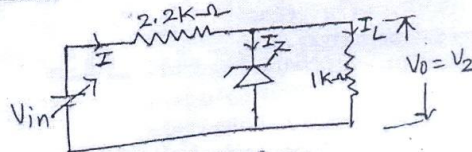
Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Explain the operation of pn junction diode under forward and reverse bias condition. (06 Marks)
- b. For a zener regulator shown in the Fig.Q.1(b), calculate the range of input voltage for which output will remain constant.

Fig.Q.1(b)



$V_z = 6.1V$, $I_{z_{min}} = 2.5mA$, $I_{z_{max}} = 25mA$, $r_z = 0\Omega$. (04 Marks)

- c. Sketch the transistor input and output characteristics of CE configuration and briefly explain the three regions of operation. (06 Marks)

OR

- 2 a. With circuit diagram, explain the operation of center-tapped full-wave rectifier. Draw input and output waveforms. (06 Marks)
- b. Explain how zener diode can be used as voltage regulator. (05 Marks)
- c. Derive the relationship between α and β . Find the values of β , α and I_E for a transistor has $I_B = 100\mu A$ and $I_C = 2mA$. (05 Marks)

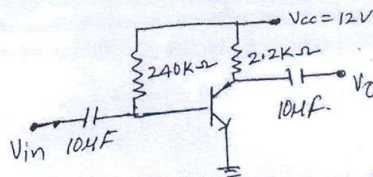
Module-2

- 3 a. With neat circuit diagram, explain the operation of voltage divider bias circuit with necessary equations. (06 Marks)
- b. Draw the circuit of op-amp integrator. Derive the expression for output voltage. (06 Marks)
- c. Calculate the o/p voltage of a three input inverting summing amplifier, given $R_1 = 200K\Omega$, $R_2 = 250K\Omega$, $R_3 = 500K\Omega$, $R_f = 1M\Omega$, $V_1 = -2V$, $V_2 = -1V$ and $V_3 = +3V$. (04 Marks)

OR

- 4 a. For the circuit shown in Fig.Q.4(a) find the Q-point values and draw DC-load line, where $V_{BE} = 0.7V$ and $\beta = 50$. (06 Marks)

Fig.Q.4(a)



- b. Draw the circuit of non-inverting op-amp. Derive the expression for the voltage gain. (05 Marks)
- c. Define the following terms with respect to op-amp: i) slew rate; ii) CMRR; iii) PSRR. (05 Marks)

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Module-3

- 5 a. Convert:
- $(526.44)_8 = (?)_2 = (?)_{10}$
 - $(48350)_{10} = (?)_{16} = (?)_8$
- b. Subtract the following using 2's complement method:
- $101011_{(2)}$ from $111001_{(2)}$
 - $111001_{(2)}$ from $101011_{(2)}$
- c. Simplify the following expression and realize using basic gates:
 $Y = A(\overline{ABC} + A\overline{BC})$.
- d. Realize half adder using NAND gates only.

(04 Marks)

(04 Marks)

(04 Marks)

(04 Marks)

OR

- 6 a. Convert:
- $(342.56)_{10} = (?)_2 = (?)_8$
 - $(BCDE) = (?)_2 = (?)_8$
- b. Perform the subtraction
- $(11010)_2 - (10000)_2$ using 1's complement.
 - $(1000100)_2 - (1010100)_2$ using 2's complement.
- c. State and prove DeMorgan's theorems.
- d. Write the symbol, truth table and final expression for NAND and Ex - OR gate (For two I/PS).

(04 Marks)

(04 Marks)

(04 Marks)

(04 Marks)

Module-4

- 7 a. With diagram and truth table explain NAND gate latch. (05 Marks)
- b. With diagram and truth table explain clocked R-S flip-flop. (05 Marks)
- c. Explain the architecture of 8051 microcontroller. (06 Marks)

OR

- 8 a. What is flip-flop? Explain the operation of NOR gate latch using its truth table. (08 Marks)
- b. With block diagram, explain microcontroller based stepper motor control system. (08 Marks)

Module-5

- 9 a. With the help of block diagram, explain communication system. (06 Marks)
- b. With circuit diagram explain the process of AM demodulation. (05 Marks)
- c. Explain the principle of operation of piezoelectric transducer. (05 Marks)

OR

- 10 a. Why modulation is necessary in communication system? List the different types of modulation schemes. (05 Marks)
- b. A carrier of 1 MHz, with 400 W of its power is amplitude modulated with a sinusoidal signal of 2500 Hz. The depth of modulation is 75%. Calculate the sideband frequencies, the band width, the power in the side bands and the total power in the modulated wave. (05 Marks)
- c. Explain the construction and the principle of operation of LVDT. (06 Marks)

CBCS SCHEME

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First/Second Semester B.E. Degree Examination, June/July 2016 Elements of Civil Engineering and Engineering Mechanics

Max. Marks:80

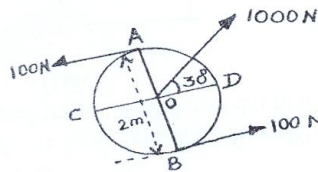
Time: 3 hrs.

Note: Answer any FIVE full questions choosing ONE full question from each Module.

MODULE - 1

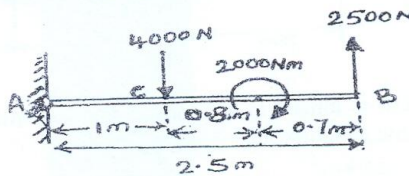
- 1 a. What is the role played by a Civil Engineer in the infrastructure development of a country? (08 Marks)
- b. Replace the force couple system by a single force with respect to AB and CD as shown in fig.1(b). (06 Marks)

Fig.Q1(b)



- c. Define Moment of a Force. (02 Marks)
- 2 a. What is the scope of (1) Environmental Engineering (2) Surveying? (06 Marks)
- b. Distinguish between Rigid pavement and Flexible pavement. (06 Marks)
- c. Fig.Q2(c) shows a cantilever beam with two forces and a couple i) Determine the resultant of a system ii) Determine an equivalent system through A. (04 Marks)

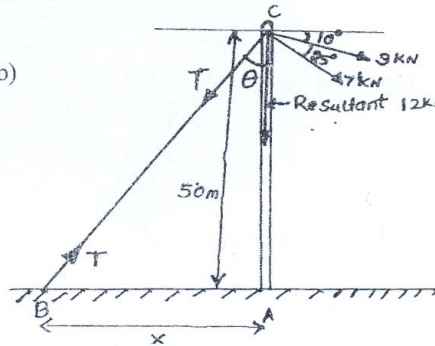
Fig.Q2(c)



MODULE - 2

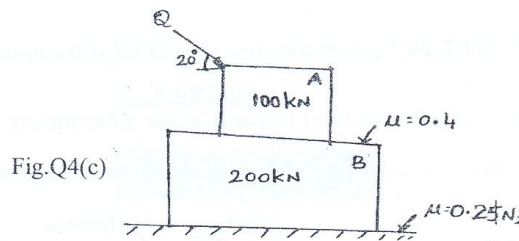
- 3 a. Define the following : i) Equilibrant ii) Resultant force iii) Angle of friction (08 Marks)
- iv) Angle of Repose.
- b. A vertical mast AC as shown in fig.Q3(b) supports two cables with tension 3kN and 7kN at the angles shown. BC is a guy wire to be situated at a distance X from the mast base. The resultant of the force system is limited to 2kN maximum and must acts vertically down the mast. Calculate the value of the distance X. (08 Marks)

Fig.Q3(b)



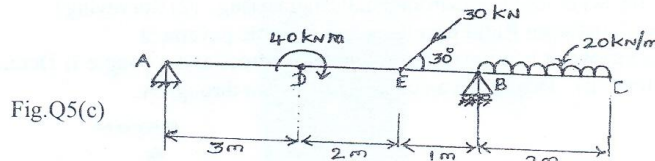
Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

- 4 a. Explain different types of frictions. (04 Marks)
 b. State and prove Lami's theorem. (04 Marks)
 c. Figure Q4(c) shows two blocks along with values of μ . Determine the force Q to be applied for impending motion between A and B. Will this force cause movement between B and the ground? (08 Marks)

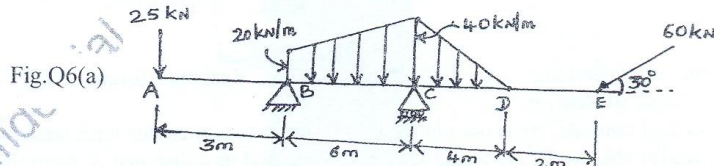


MODULE - 3

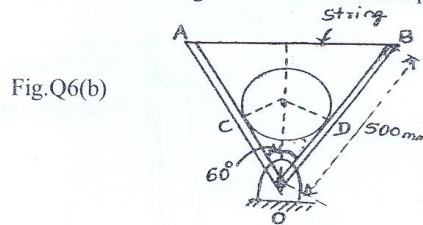
- 5 a. Mention the different types of supports with neat sketch. (04 Marks)
 b. Explain different types of horizontal members which generally placed on supports. (04 Marks)
 c. Determine the reactions at A and B of the overhanging beam as shown in fig. Q5(c). (08 Marks)



- 6 a. A beam ABCDE is hinged at supports B and has roller at C carries load as shown in fig. Q6(a). Determine supports reactions. (08 Marks)

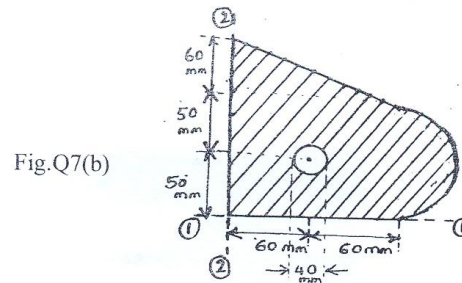


- b. A cylinder of radius 50mm and weighing 200N is kept in equilibrium position as shown in fig. Q6(b). Find tension in the string AB and reaction component at hinge O. (08 Marks)

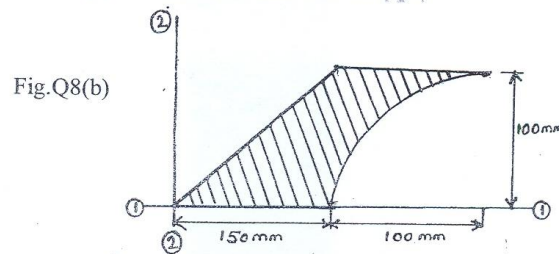


MODULE - 4

- 7 a. State and prove parallel axis theorem. (06 Marks)
 b. Determine the position of centroid of the lamina with circular cutout as shown in fig. Q7(b). (10 Marks)



- 8 a. Determine Centroid of a triangle by method of Integration. (06 Marks)
 b. Find the moment of Inertia of the region in fig. Q8(b) about horizontal axis ①-① and also find the radius of gyration about the same axis. (10 Marks)

MODULE - 5

- 9 a. Define the following : i) Kinematics ii) Kinetics iii) Motion iv) Path. (04 Marks)
 b. What is Super elevation and what is its necessity? (04 Marks)
 c. A projectile is projected from a point at an angle of elevation of 30° with a velocity of 600m/sec. Find the velocity and direction of motion of the particle at the end of
 i) 25 seconds ii) 40 seconds. (08 Marks)
- 10 a. Define the following : i) Uniform velocity ii) Rectilinear motion iii) Curvilinear motion iv) Projectile. (04 Marks)
 b. A particle falling under gravity falls 30 meters in a certain second. Find the time required to cover the next 30 meters. Take $g = 9.8\text{m/sec}^2$. (04 Marks)
 c. A vehicle carrying a vertical rocket launcher moves to the right at a constant velocity 35m/s along horizontal track. It launches a rocket vertically upwards with an initial velocity of 45m/s relative to the vehicle.
 i) How high will the rocket go up?
 ii) Where will the rocket land relative to the vehicle?
 iii) How far does the vehicle move while the rocket is in the air?
 iv) At what angle relative to the horizontal is the rocket travelling just when it leaves the vehicle as observed by an observer at rest on the ground? (08 Marks)

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15EME14/24

First/Second Semester B.E. Degree Examination, June/July 2016 Elements of Mechanical Engineering

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Explain the working of a hydroelectric power plant with a neat sketch. (10 Marks)
b. Distinguish between renewable and non-renewable sources of energy with suitable examples. (06 Marks)

OR

- 2 a. With a neat sketch, explain the working of a water tube boiler. Show the path of flue gases. (10 Marks)
b. Draw a neat sketch of temperature-Enthalpy diagram and indicate the following on it:
Latent heat of evaporation, Amount of super heat, Sensible heat, Degree of superheat, Saturation temperature. (06 Marks)

Module-2

- 3 a. Discuss the advantages of steam turbines over other prime movers. (10 Marks)
b. Draw a neat sketch of a simple impulse water turbine indicating the parts. Explain its working. (06 Marks)

OR

- 4 a. Explain the working of a four stroke petrol engine with neat sketches. (10 Marks)
b. A 4-cylinder two stroke engine develops 30 kW at 2500 rpm. Calculate the diameter and stroke of each cylinder if the stroke to bore ratio is 1.5. The mean effective pressure on each piston is 6 bar and its mechanical efficiency is 80%. (06 Marks)

Module-3

- 5 a. Explain the process of taper turning by swiveling of the compound rest with a neat sketch. (10 Marks)
b. Differentiate between:
(i) Drilling and reaming.
(ii) Boring and counter boring. (06 Marks)

OR

- 6 a. Explain the Cartesian co-ordinate configuration and spherical co-ordinate configuration of robots with neat sketches. (10 Marks)
b. Mention the advantages and limitations of automation. (06 Marks)

Module-4

- 7 a. Define composite materials. How are composites classified? (10 Marks)
b. Mention the applications of composite materials in aerospace and automotive industries. (06 Marks)

OR

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- 8 a. Explain the principle of arc welding with a neat sketch. (10 Marks)
b. List the different types of oxyacetylene flames and state their applications. (06 Marks)

Module-5

- 9 a. Explain the working principle of a vapour compression refrigeration system with a neat sketch. (10 Marks)
b. List the desirable properties of a refrigerant. (06 Marks)

OR

- 10 a. With a neat sketch, explain the working of a room air conditioner. (10 Marks)
b. Distinguish between refrigeration and air conditioning. (06 Marks)

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Question Paper Version : C

First/Second Semester B.E Degree Examination, June/July 2016
Constitution of India, Professional Ethics & Human Rights
 (COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 40

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the forty questions, each question carries **ONE mark**.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

1. Cultural and Educational Rights under Article 29 and 30 are also called as _____
 a) Legal Rights b) Moral Rights c) Minority Rights d) Majority Rights
2. The aim of the Directive principles of State policy is to establish
 a) Socialist State in our Country b) Capitalist State in our Country
 c) Welfare State in our Country d) None of these
3. The Framers of the Indian Constitution borrowed the concept of directive principles of State policy from the constitution of
 a) USA b) Ireland c) Germany d) British
4. Fundamental Duties are applicable to all
 a) States b) Citizens c) Persons d) Foreigners
5. Respecting our National Flag is a
 a) Directive Principles of State policy b) Fundamental Rights
 c) Fundamental Duties d) None of these
6. Who appoints the Governor of the State
 a) The President b) Chief Justice of India
 c) Chief Justice of State d) Chief Minister
7. A High Court judge retires at the age of
 a) 65 years b) 62 years c) 63 years d) 60 years
8. How many houses are there in the Parliament
 a) 3 b) 4 c) 2 d) 5

9. Election Commission of India is
 a) Multimember commission
 b) Two member commission
 c) One member commission
 d) None of these.
10. The power to superintend direct and control elections is rested in the ____
 a) Finance commission
 b) Planning commission
 c) Cabinet commission
 d) Election commission
11. While Proclamation of Emergency is in operation, the President cannot suspend certain Fundamental rights
 a) Article 14 & 16
 b) Article 32
 c) Article 19 & 23
 d) Article 20 & 21
12. When a State Emergency is declared all or any of the functions of the State Government are assumed by the
 a) President
 b) Governor
 c) Chief Minister
 d) Union cabinet
13. The National Human Rights commission of India constituted on
 a) 14 October 1992
 b) 20 October 1994
 c) 12 October 1993
 d) 02 October 1996
14. Human Rights are
 a) Local
 b) Universal
 c) Regional
 d) None of these
15. The Town and City municipality members enjoy a term of ____ years
 a) 4 years
 b) 6 years
 c) 3 years
 d) 5 years
16. It is not a kind of trademark
 a) Symbols
 b) Sounds
 c) Goodwill
 d) Designs
17. An author retains copy right for
 a) 100 years
 b) 50 years
 c) 60 years
 d) 20 years
18. The risk expert's approach is usually
 a) Biased
 b) Favorable to employer
 c) Utilitarian
 d) None of these
19. In which year did the cabinet mission come to India
 a) 1942
 b) 1946
 c) 1947
 d) 1949
20. Who of the following acted as the constitutional advisor to the Constituent Assembly
 a) Sachidananda Sinha
 b) B.R. Ambedkar
 c) Rajendra Prasad
 d) B.N. Rau.
21. India has been described under Article 1 of the constitution as a
 a) Confederation
 b) Federation
 c) Federation with strong unitary bias
 d) Union of States
22. Preamble declares that the constitution of India was adopted on
 a) 26th November 1949
 b) 15th August 1947
 c) 26th January 1950
 d) 15th July 1946
23. The Constitution supports
 a) Rule of Men
 b) Rule of Individuals
 c) Rule of Law
 d) Rule of women
24. Part IIIrd from Articles 12 to 35 of the Indian constitution contains
 a) Fundamental Rights
 b) Directive principles of State policy
 c) Emergency provisions
 d) Citizenship.
25. Original constitution classified Fundamental Rights into seven categories but now there are
 a) Five Rights
 b) Six Rights
 c) Four Rights
 d) Eight Rights

26. The President of India is
 a) Elected b) Selected c) Appointed d) Nominated
27. The term of office of the President is _____ years.
 a) 5 years b) 4 years c) 6 years d) 7 years
28. The present Speaker of the Lok Sabha is _____
 a) Meira Kumar b) Sumitra Mahajan c) Somnath Chatterjee d) Jaypal Reddy
29. Maximum strength of Rajya Sabha is
 a) 200 b) 280 c) 250 d) 300
30. The Prime Minister is
 a) Constitutional Head b) Head of State
 c) Head of State as well as Government d) Head of Government
31. According to Indian constitution the power of amending the constitution are rested with
 a) President of India b) Parliament of India
 c) People of India d) The Prime Minister of India
32. Which of the following words was not added by the 42nd Amendment Act, to the Indian Constitution
 a) Secular b) Socialist c) Flexible d) Integrity
33. Minority Groups are recognized on the basis of their
 a) Population b) Religion c) Race d) Caste
34. Jobs are reserved for SC & ST people
 a) At the time of appointment b) At the time of promotion
 c) Both at the time of appointment and promotion
 d) On the basis of their annual income
35. Under the provisions of which Article of the constitution the Government abolished the practice of untouchability
 a) Article 18 b) Article 17 c) Article 16 d) Article 20
36. Gram Panchayat is a completely _____ body
 a) Elected b) Nominated c) Selected d) None of these
37. Gram Panchayat is the primary organ of the _____ tier system
 a) Two b) Four c) Three d) One
38. Professional Ethics is
 a) Set of rules passed by professional bodies
 b) Set of rules relating to personal character of professionals
 c) Set of standards adopted by Professionals
 d) Traditional rules observed since a long time.
39. Minimalist view means
 a) A narrow thinking b) A ministerial view
 c) A novel plan to minimize industrial loss d) A concept of responsibility.
40. The formulae of a soft drink is an example of
 a) Trade secret b) Patent c) Copy right d) Trade mark

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Question Paper Version : B

First/Second Semester B.E Degree Examination, June/July 2016
Environmental Studies

(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 40

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the forty questions, each question carries **ONE mark**.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. For each question, after selecting your answer, **darken** the appropriate circle corresponding to the same question number on the OMR sheet.
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

1. Smog is a,

a) National phenomena	b) Colourless
c) Combination of smoke and Fog	d) None of these
2. Which of the following is the source of Fly ash,

a) Vehicle exhausts	b) Sewage	c) Thermal power plant	d) All of these
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3. Ozone layer thickness is measured in,

a) PPM	b) PPb	c) Decibels	d) Dobson unit
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4. Energy is measured in,

a) BIU	b) Bhu	c) Btu	d) Ntu
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5. Nuclear waste is active for,

a) 5 year	b) 10 years	c) 50 years	d) 100 years
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6. Charnobyl nuclear disaster occurred in the year,

a) 1984	b) 1987	c) 1986	d) 1988
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7. Demography is the study of,

a) Animals behaviour	b) Population growth	c) River	d) None of these
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8. Ozone layer is present in,
a) Troposphere b) Stratosphere c) Mesosphere d) Thermosphere
9. The Central Pollution Control Board (CPCB) was established in the year,
a) 1974 b) 1982 c) 1986 d) 1976
10. Which of the following is NGO?
a) Narmada Bachao Andolan b) CPCB
c) KSPCB d) None of these
11. Who is the author of the book "Silent Spring"?
a) Robin cook b) Arthur Hailey c) Rachel carson d) Darwin
12. Amount of oxygen present in atmospheric air is,
a) 0.03% b) 21% c) 36% d) 0.9%
13. Remote sensing is a,
a) Satellite system b) Ground system c) Sensor system d) None of the above
14. GIS can be expanded as,
a) Geological information system b) Geographic information system
c) Geographic internet system d) Geodynamic information system
15. Geothermal energy is a,
a) Heat energy b) Wind energy c) Current energy d) Solar energy
16. The international protocol to protect the ozone layer is,
a) The Montreal protocol b) Kyoto protocol
c) The Vienna protocol d) Cartagena protocol
17. Which of the following is not a green house gas,
a) Hydrochloro fluorocarbons b) Methane
c) Carbon dioxide d) Oxygen
18. Major compound responsible for the destruction of stratospheric ozone layer is,
a) Oxygen b) CFC c) Carbon dioxide d) Methane
19. Which of the following is not a method for water conservation?
a) Rain water harvesting b) Ground water extraction
c) Improving irrigation efficiency d) Avoiding water wastage.
20. What is the permissible range of pH for drinking water as per the Indian standards?
a) 6 – 9 b) 6 – 8.5 c) 6.5 – 7.5 d) 6.5 to 8.5
21. The term ecosystem was proposed by,
a) Jacob Van Verkul b) A.G. Tansley
c) Costanza d) Marrie Gibbs

22. World Environment day is on,
 a) 5th May b) 5th June c) 18th July d) 16th August
23. Physical pollution of water is due to,
 a) Dissolved oxygen b) Turbidity c) PH d) None of the above
24. Which pyramid is always upright?
 a) Energy b) Bio mass c) Numbers d) Food chain
25. Disfigurement in the teeth is caused by excessive amount of,
 a) Mercury b) Nitrate c) Fluoride d) Lead
26. The Leader of chipko movement is,
 a) Sunderlal Bahuguna b) Medha Patkar
 c) Vandana Shiva d) Suresh Heblkar
27. In an ecosystem the flow of energy is,
 a) Bidirectional b) Unidirectional c) Cyclic d) None of these
28. E.I.A is related to,
 a) Resource conservation b) Efficient equipment process
 c) Waste minimization d) All of the above
29. Taj Mahal at Agra may be damaged by,
 a) Sulphur dioxide b) Chlorine c) Hydrogen d) Oxygen
30. Minamata disease is caused due to
 a) Lead b) Arsenic c) Mercury d) Codmium
31. The first international earth Summit was held in,
 a) Johannes burg b) Kyoto c) Riode Janeiro d) Stock holm
32. In aquatic ecosystem, phytoplankton can be considered as a,
 a) Consumer b) Producer c) Decomposers d) Macro consumer
33. Which state is having highest woman literacy rate in India?
 a) Karnataka b) Punjab c) Rajastan d) Kerala
34. _____ are referred to as earth's Lungs,
 a) Forest b) Carbon cycle c) Water sources d) Mines
35. Biomass power generation uses,
 a) Crop b) Animal dung c) Wood d) All of these
36. Water use for irrigation of food crops, fodder crops and medical herbs is known as,
 a) Consumptive use b) Commercial use c) Auxiliary use d) Productive use

37. Global warming could affect,
a) Climate b) Increase in sea level c) Melting of Glaciers d) All of the above
38. The average life expectancy around the world is currently,
a) decreasing b) increasing c) not changing d) stabilizing
39. The objective of integrated child development services (ICDS) are,
a) Immunization b) Health checkup and referral services
c) Pre school non formal education d) All of these
40. The universal declaration of Human rights was proclaimed by the UN in the year,
a) 1946 b) 1947 c) 1948 d) 1949

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15MAT21

Second Semester B.E. Degree Examination, June/July 2016 Engineering Mathematics – II

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Solve : $(4D^4 - 8D^3 - 7D^2 + 11D + 6)y = 0$. (05 Marks)
- b. Solve $\frac{d^2y}{dx^2} - 4y = \cosh(2x - 1) + 3^x$, using inverse differential operator method. (05 Marks)
- c. Solve : $\frac{d^2y}{dx^2} - y = \frac{2}{1 + e^x}$ by the method of variation of parameters. (06 Marks)

OR

- 2 a. Solve : $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 1 + 3x + x^2$, using inverse differential operator method. (05 Marks)
- b. Solve : $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x \cos x$, using inverse differential operator method. (05 Marks)
- c. Solve : $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = x^2 + e^x$ by the method of undetermined coefficients. (06 Marks)

Module-2

- 3 a. Solve : $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 4y = (1 + x)^2$ (06 Marks)
- b. Solve : $y \left(\frac{dy}{dx} \right)^2 + (x + y) \frac{dy}{dx} - x = 0$. (05 Marks)
- c. Solve : $y = 2px + p^2y$ by solving for x. (05 Marks)

OR

- 4 a. Solve : $(3x + 2)^2 y'' + 3(3x + 2)y' - 36y = 8x^2 + 4x + 1$. (06 Marks)
- b. Solve : $y - 2px = \tan^{-1}(xp^2)$ (05 Marks)
- c. Solve the equation $(px - y)(py + x) = 2p$ by reducing it into Clairaut's form by taking a substitution $X = x^2$ and $Y = y^2$. (05 Marks)

Module-3

- 5 a. Obtain the partial differential equation by eliminating the arbitrary functions, given that $z = yf(x) + x\phi(y)$ (05 Marks)
- b. Solve $\frac{\partial^2 u}{\partial x \partial y} = \frac{x}{y}$ subject to the conditions $\frac{\partial z}{\partial x} = \log x$ when $y = 1$ and $z = 0$ when $x = 1$. (05 Marks)
- c. Derive the one dimensional wave equation in the form, $\frac{\partial^2 u}{\partial t^2} = C^2 \frac{\partial^2 u}{\partial x^2}$ (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8=50, will be treated as malpractice.

OR

- 6 a. Obtain the partial differential equation of the function, $f\left(\frac{xy}{z}, z\right) = 0$. (05 Marks)
- b. Solve $\frac{\partial^2 z}{\partial x^2} + 3\frac{\partial z}{\partial x} - 4z = 0$, subject to the conditions $z = 1$ and $\frac{\partial z}{\partial x} = y$ when $x = 0$. (05 Marks)
- c. Derive the one dimensional heat equation in the form $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$. (06 Marks)

Module-4

- 7 a. Evaluate $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} xyz \, dz \, dy \, dx$. (06 Marks)
- b. Evaluate $\int_0^1 \int_x^{\sqrt{x}} xy \, dy \, dx$ by changing the order of integration. (05 Marks)
- c. Obtain the relation between beta and gamma function in the form,

$$\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$$
 (05 Marks)

OR

- 8 a. Evaluate $\int_0^{\infty} \int_0^{\infty} e^{-(x^2+y^2)} \, dx \, dy$ by changing into polar co-ordinates. (06 Marks)
- b. Find the area enclosed by the curve $r = a(1 + \cos\theta)$ above the initial line. (05 Marks)
- c. Prove that $\int_0^{\frac{\pi}{2}} \frac{d\theta}{\sqrt{\sin\theta}} \times \int_0^{\frac{\pi}{2}} \sqrt{\sin\theta} \, d\theta = \pi$ (05 Marks)

Module-5

- 9 a. Evaluate : (i) $L\left\{\frac{\cos 2t - \cos 3t}{t}\right\}$ (ii) $L\{t^2 e^{-3t} \sin 2t\}$ (06 Marks)
- b. If $f(t) = \begin{cases} t, & 0 \leq t \leq a \\ 2a - t, & a \leq t \leq 2a \end{cases}$, $f(t+2a) = f(t)$ then show that $L[f(t)] = \frac{1}{s^2} \tanh\left(\frac{as}{2}\right)$. (05 Marks)
- c. Solve by using Laplace transforms,

$$\frac{d^2 y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}, y(0) = 0, y'(0) = 0$$
 (05 Marks)

OR

- 10 a. Evaluate $L^{-1}\left\{\frac{4s+5}{(s+1)^2(s+2)}\right\}$. (06 Marks)
- b. Find $L^{-1}\left\{\frac{1}{s(s^2+a^2)}\right\}$ by using convolution theorem. (05 Marks)
- c. Express $f(t) = \begin{cases} 1, & 0 < t \leq 1 \\ t, & 1 < t \leq 2 \\ t^2, & t > 2 \end{cases}$ in terms of unit step function and hence find its Laplace transform. (05 Marks)
