B. Tech. (Mechanical Engg.) –3rd Semester G-Scheme

Examination, December, 2024

BIOLOGY

Paper : BSC-Bio-201-G

Time allowed : 3 hours]   *[Maximum marks : 75*

Note: *Attempt five questions in all, selecting at least **one** question from each unit.* ***Q. No. 1 is compulsory.*** *All questions carry equal marks.*

1. Explain in brief :   6×2.5=15

    (a)   Role of biotechnology in agriculture

    (b)   Transgenic plants

    (c)   Structure and function of lipids

    (d)   Genetic material

    (e)   Economic importance of microbes

    (f)   Structure of prokaryotic cell

Unit–I

2. What are microbes? Explain in detail the types, Important features and economic importance of microbes.   15

3018-P-2-Q-9 (24)   [P.T.O.

3.   Explain the following in detail :

(a)   Gene interaction   7.5

(b)   Mitosis   7.5

Unit–II

4.   What is genetic material? Explain its types and their structures. Explain the different models.   15

5.   Explain in detail :

(a)   Structure and function of proteins   7.5

(b)   Different types of carbohydrates   7.5

Unit–III

6.   What is genetic engineering? Explain the process of rDNA technology in detail with diagrams.   15

7.   Explain in detail :

(a)   DNA modifying enzymes   7.5

(b)   Plasmid vector   7.5

Unit–IV

8.   Explain the various roles of Biotechnology in betterment of environment in detail.   15

9.   Explain in detail :

(a)   Various application of enzyme biotechnology

                                                      7.5

(b)   Role of biotechnology in medicine   7.5

B.Tech. (ME) 3rd Semester (G-Scheme)

Examination, December–2024

PHYSICS-II (OPTICS AND WAVES)

Paper–BSC-ME-201G

Time allowed : 3 hours]   [Maximum marks : 75

Note : *Attempt five questions in all selectign **one** from each section. **Question no.1 is compulsory.** All questions carry equal marks.*

1. (a) The displacement of a particle executing SHM is given by $x = 0.01 \sin 100\pi(t+0.05)$ determine the amplitude, time period and frequency of SHM.

    (b) Explain the phenomenon of total internal reflection with the help of a neat diagram.

    (c) Two waves of amplitude 4 and 2 units are superposed with their vibrations parallel. Deduce the ratio of the maximum to minimum intensity as phase relation varies.

    (d) What are transverse and longitudinal waves? Give two examples of each.

    (e) Differentiate between spontaneous and stimulated emission.

    (f) What is laser pumping? Discuss different methods of laser pumping.

    $6 \times 2.5 = 15$

3056-P-3-Q-9(24)   [P.T.O.

Section-1

2. What do you understand by simple harmonic motion? Obtain the differential equation for simple harmonic motion of a simple pendulum and derive the expression for total energy of simple pendulum. 15

3. What is forced harmonic oscillator? Write its differential equation and discuss the steady state of a forced harmonic oscillator subjected to an external periodic force. Discuss the condition of resonance in terms of natural and driving frequency. 15

Section-2

4. (a) Derive the expression for the velocity of longitudinal waves in the solid. 7

   (b) What is the matrix method in paraxial Optics? How can the matrix method be applied to translation and refraction problem? 8

5. Write Fresnel's equation in nonconducting isotropic media when electric field vector E is perpendicular to the plane of incidence (TM mode) and hence derive the relation for transmission and reflection coefficient. 15

Section-3

6. (a) Explain the formation of interference fringes in Newtons' ring experiment in reflected system of light. Derive the expression for measurement of the wavelength of light. 12

   (b) In a Newton's ring experiment, the diameter of 5th and 25th rings are 0.3 cm and 0.8 cm respectively. Find the wavelength of light, R = 100 cm. 3

7. Distinguish between Fraunhofer and Fresnel type of diffraction. Discuss analytically the intensity distribution in Fraunhofer diffraction at a single slit. 15

Section-4

8. (a) Describe the principle, construction and working of Nd:YAG laser. 12

   (b) Which one is better Ruby laser or He-Ne- laser? Explain. 3

9. (a) Explain the concept of directionality, intensity, monochromaticity and coherence as applied to lasers. 10

   (b) Discuss at least six applications of lasers in detail. 5

B.Tech. 3rd Semester (ME) (G-Scheme) Examination,

December–2024

MATHEMATICS–III

Paper–BSC-ME-203-G

PDE, Probability and Statistics

Time allowed : 3 hours]   [Maximum marks : 75

Before answering the questions, candidate should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after the examination.

Note : *Attempt **five** questions in all ; selecting **one** question from each unit. **Question No. 1 is compulsory.***

1. (a) Solve $\dfrac{\partial^2 z}{\partial x^2} + z = 0$, given that $x = 0$, $z = e^y$ and

$\dfrac{\partial z}{\partial x} = 1$.

(b) Classify the following equations :

$$\frac{\partial^2 u}{\partial x^2} + 4\frac{\partial^2 u}{\partial x\,\partial y} + 4\frac{\partial^2 u}{\partial y^2} - \frac{\partial u}{\partial x} + 2\frac{\partial u}{\partial y} = 0$$

(c) Prove that $\dfrac{d}{dx} J_0(x) = -J_1(x)$.

        [P.T.O.

(d) Express $2 - 3x + 4x^2$ in terms of Legendre function.

(e) A bag contains 7 white, 6 red and 8 black balls. Two balls are drawn at random. Find the probability tht both will be white.

(f) Three cities A, B, C are equidistant from each other. A motorist travels from A to B at 30 km/hr, from B to C at 40 km/hr, from C to A at 50 km/hr Determine the average speed. $6 \times 2.5 = 15$

Unit–I

2. (a) Solve the differential equation

$$x^2 (y - z) p + y^2 (z - x) q = z^2 (x - y).$$ 8

(b) Solve $\dfrac{\partial^2 z}{\partial x^2} + \dfrac{\partial^2 u}{\partial x \, \partial y} - 6 \dfrac{\partial^2 z}{\partial y^2} = y \cos x.$ 7

3. (a) Solve $(D - 3D' - 2)^3 z = 6 e^{2x} \sin (3x + y).$ 8

(b) Find the deflection of a vibrating string of unit length having fixed ends with initial velocity zero and initial deflection $f(x) = k (\sin x - \sin 2x)$. 7

Unit–II

4. (a) Solve by the method of separation of variables :

$$\frac{\partial u}{\partial x} = 2 \frac{\partial u}{\partial t} + u, \text{ where } u(x, 0) = 6 e^{-3x}.$$ 8

(b) Show that

$$\int_0^1 x^3 J_0 (x) \, dx = 2 J_0 (1) - 3 J_1 (1).$$ 7

5. (a) Prove that

$$(n + 1) P_{n+1} (x) = (2n + 1) x P_n (x) - n P_{n-1} (x).$$ 7

(b) Prove that $(1 - 2xz + x^2)^{-\frac{1}{2}}$ is a solution of the equation $z \dfrac{\partial^2 (zv)}{\partial x^2} + \dfrac{\partial}{\partial x} \left[(1 - x^2) \dfrac{\partial v}{\partial x} \right] = 0.$ 8

Unit–III

6. (a) A speaks truth in 60% cases and B in 70% cases. In what percent (%) of cases are they likely to contradict to each other in stating the same fact ? 7

(b) Find defective bulbs are accidentally mixed with twenty good ones. It is not possible to just look at a bulb and tell whether or not it is defective. Find the probability distribution of the number of defective bulbs, if four bulbs are drawn at random from this lot. 8

7. (a) The probability that a man aged 60 will live to be 70 is 0.65. What is the probability that out of 10 men now 60, at least 7 would live to be 70 ? 7

(b) If the probability of a bad reaction from a certain injection is 0.001, Determine the chances that out of 2000 individuals more than two will get a bad reaction. 8

Unit–IV

8. (a) Find the mean, median and mode for the following : 7

Mid value : 15 20 25 30 35 40 45 50 55
Frequency : 2 22 19 14 3 4 6 1 1

(b) Find the rank correlation coefficient between x and y from the given data : 8

x : 78 89 97 69 59 79 68 57
y : 125 137 156 112 107 138 123 108

9. (a) The first four moments about the working mean 28.5 of a distribution are 0.294, 7.144, 42.409 and 454.98. Calculate the moments about the mean and hence skewness and kurtosis of the distribution. 7

(b) Samples of sizes 10 and 14 were taken from two normal populations with S.D. 3.5 and 5.2. The sample means were found to be 20.3 and 18.6. Test whether the means of the two populations are the same at 5% level. 8

3057

B. Tech. (ME) 3rd Semester G-Scheme
Examination, December–2024

BASICS OF ELECTRONICS ENGINEERING

Paper-ESC-ECE-207-G

Time allowed : 3 hours]   *[Maximum marks : 75*

*Note : Attempt five questions in all, selecting **one** question from each unit. **Question No. 1 is compulsory.** All questions carry equal marks.*

1.   (a)   What do you mean by conductors?

       (b)   What is the disadvantages of negative feedback?

       (c)   Draw the block diagram of 8:1 multiplexer?

       (d)   What is the need of feedback in amplifier?

       (e)   What is Barkhausen's criteria for oscillations?

       (f)   What is the need of biasing?

                                     $6 \times 2.5 = 15$

Unit-I

2.   (a)   What is a PN Junction? Draw its V-I characteristics in different bias configuration. 10

       (b)   Find out the rectification efficiency in full wave rectifier.   5

3.   (a)   Draw the circuit diagram of a CB amplifier and explain its input output characteristics.   10

                          [P.T.O.

(b) What is frequency response curve for an amplifier and find out its Bandwidth?   5

Unit-II

4. Write short note on :   15

    (a) Non-inverting amplifier

    (b) Inverting amplifier

5. (a) Explain ideal op-amp characteristics in detail. 7.5

    (b) What are the effects of negative feedback in case of op-amp?   7.5

Unit-III

6. Explain the working of RC phase shift oscillator using NPN transistor.   15

7. (a) Draw and explain the working of a Wien bridge oscillator.   10

    (b) Explain mono stable multivibrator in detail.   5

Unit-IV

8. Explain universal property of gates in detail.   15

9. Explain the following :   15

    (a) GSM system

    (b) Elements of communication system

B. Tech. (ME) 3rd Semester (G-Scheme)

Examination, December–2024

BASICS OF MECHANICAL ENGINEERING

Paper-ESC-ME-211G

Time allowed : 3 hours]   *[Maximum marks : 75*

*Note : Attempt any **five** questions in all, selecting **one** question from each unit. **Question No. 1** is compulsory. All questions carry equal marks.*

1.   Explain the following :   6×2.5=15

     (a)   Working principle of shaper

     (b)   Strain and types of strain

     (c)   Limitations of manual part programming

     (d)   Zeroth Law of Thermodynamics

     (e)   Working of clutch

     (f)   Working of pelton turbine

Unit-I

2.   Describe the different machining operations that can be performed on a Lathe Machine.   15

3.   Define first law of thermodynamics. Discuss the limitations of first law of thermodynamics.   15

Unit-II

4. Discuss the different thermodynamic properties of steam.   15

5. Explain different types of turbine. Also derive the efficiency of pelton wheel.   15

Unit-III

6. Derive velocity ratio of simple and compound belt drive.

                                                          15

7. Explain the stress-strain diagram in details.   15

Unit-IV

8. What are NC Machines? Explain their classification in details.   15

9. Explain Manufacuturing systems. What are the difference between NC and CNC Machines.   15

B.Tech. (ME) 3th Semester (G-Scheme)

Examination, December-2024

THERMODYNAMICS

Paper -PCC-ME-213-G

Time allowed : 3 hours] [*Maximum marks : 75*

*Note : Attempt any **five** questions in all, selecting **one** question from each unit. **Question No. 1** is **compulsory**. All questions carry equal marks.*

1. Explain the following:

    (a) Intensive and extensive properties

    (b) First law of thermodynemics

    (c) Entropy

    (d) Thermal efficiency and COP

    (e) Thermodynamic system

    (f) Saturation State. $6 \times 2.5 = 15$

Unit-I

2. (a) What is quasi-static process?   5

   (b) A piston cylinder device with air at initial temperature of 30°C undergo an expansion process for which pressure and volume are related given below-   10

P(KPa)	100	37.9	14.4
V(m³)	0.1	0.2	0.4

   Calculate the work done by the system.

3. (a) Define the terms state, path, process and cycle. 7

   (b) Explain first law of thermodynamics for cycle and non-cyclic processes.   8

Unit-II

4. Explain the use of steam table and Mollier's chart. 15

5. Find the internal energy of 1 kg of steam at 20 bar when

   (i) It is superheated, its temperature being 400°C.

   (ii) It is wet, its dryness being 0.9.

   Specific heat for steam = 2 kJ/kg K.   15

Unit-III

6. Write the steady flow energy equation for stead flow. Apply it to expansion valve and compressor.   15

7. A reversible heat engine operates between two reservoirs at temperatures of 600°C and 40° C. The engine drives a reversible refrigerator which operates between reservoirs at temperatures of 40° C and –20° C. The heat transfer to the heat engine is 2000kJ and the net work output of the combined engine transfer plant is 360kJ. Evaluate the heat transfer to the refrigerant and the net heat transfer to the reservoir at 40° C.   15

Unit-IV

8. Explain the Clausius inequality. A Carnot engine operates between 4° C and 280° C. If the engine produces 300 kJ of work, Determine the entropy change during heat addition and heat rejection.   15

9. Draw line diagram of Brayton cycle represent on p-v diagram and derive expression for efficiency of Brayton cycle.   15

B.Tech. 3rd Semester (G-Scheme) Examination,

December–2024

ENGINEERING MECHANICS

Paper–ESC-ME-209-G

Time allowed : 3 hours]   *[Maximum marks : 75*

*Note : Attempt any **five** questions in total, at least **one***

*question from each section. **Question No. 1** is*

compulsory.

1. Explain following :

     (a)   Dimensional homogeneity

     (b)   Concurrent force

     (c)   Fixed beam

     (d)   Polar moment of inertia

     (e)   Centre of mass

     (f)   Method of joint $6×2.5=15$

3073–P–7–Q–9 (24)   [P.T.O.

Section–A

2. (a) The following forces act at a point :

    (i)   20 N inclined at 30° towards North of East,

    (ii) 25 N towards North,

    (iii) 30 N towards North-West, and

    (iv) 35 N inclined at 40° towards South of West.

    Find the magnitude and direction of the resultant force.   8

    (b) ABCD is a rectangle, such that AB = CD = a and BC = DA = b. Forces equal to P act along AD and CB and forces equal to Q act along AB and CD respectively. Prove that the perpendicular distance between the resultants of P and Q at A and that of P and Q at C

    $$= \frac{(P \times a) - (Q \times b)}{\sqrt{P^2 + Q^2}}$$ 7

3. An elastic string AB is just taut before a force of 500 N is applied at its centre. If the string takes 4 N/mm of elongation of the string, at what angle (a), equilibrium will be maintained after the application of 500 N force as shown in figure.   15
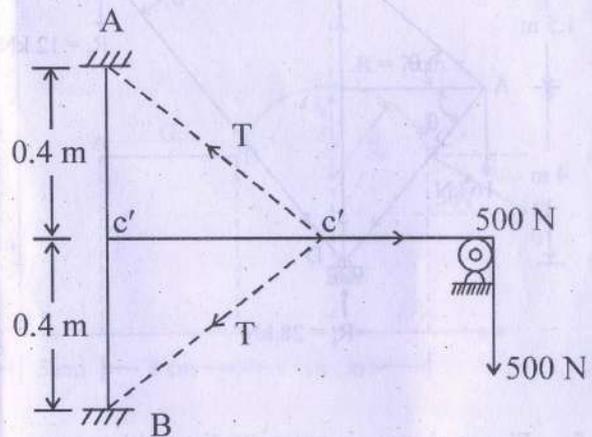
Section–B

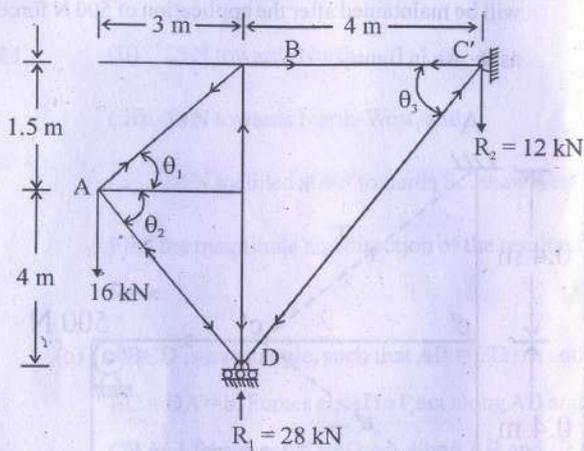4. Figure shows a truss ABCD hinged at C and roller supported at D, carrying a vertical load of 16 kN

at A. Determine reaction forces in the members of
the truss. 15

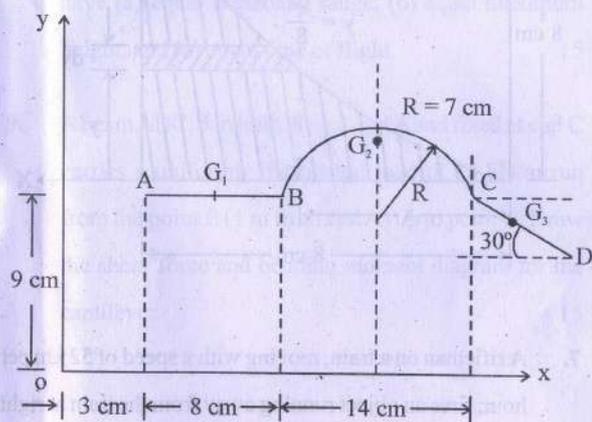$R_2 = 12$ kN

16 kN

$R_1 = 28$ kN

5. Figure shows a composite line with segments
AB = 8 cm (parallel to ox), BC = a semi circle of radius
7 cm and CÐ = 8 cm, a straight line segment inclined at

angle 30° to axis ox. Determine the position of
the centroid of the composite line. Co-ordinates of
point A are (3, 9). 15

Section–C

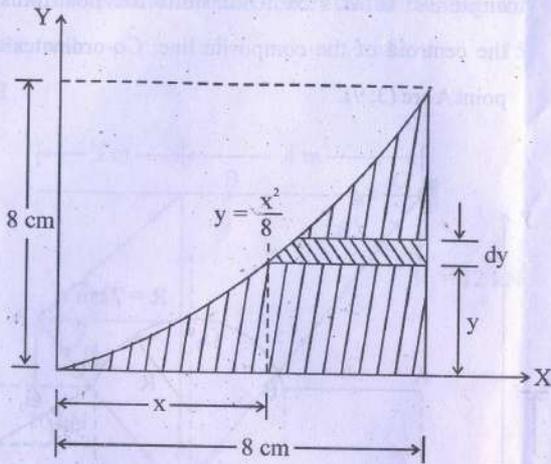6. A parabolic curve is shown in figure. For the shaded area,
determine I_{xx} and I_{yy}. 15

$$y = \frac{x^2}{8}$$

8 cm

8 cm

7. A rifleman on a train, moving with a speed of 52 km per hour, fires an object running away from the train at right angle with a speed of 39 km per hour. The line connecting the man and the object makes an angle of 30° to the train at the instant of shooting. At what angle to the train should he aim in order to hit the object, if the muzzle velocity is 200 m/s ?   15

Section–D

8. A particle is thrown with a velocity of 5 m/s at an elevation of 60° to the horizontal. Find the velocity of another particle thrown at an elevation of 45° which will have (a) equal horizontal range, (b) equal maximum height, and (c) equal time of flight.   15

9. A beam ABC, 5 m long, free at end A and fixed at end C carries a uniformly distributed load of 15 kN/m run from the point B (1 m from end A) up to point C. Draw the shear force and bending moment diagram for the cantilever.   15

3018

B.Tech. 3rd Semester (Biotech.) (G-Scheme)

Examination, November-2023

BIOLOGY

Paper—BSC-BIO-201-G

Time allowed : 3 hours]   *[Maximum marks : 75*

Note : *Question no.* **1** *is compulsory and attempt* **four** *more*
questions by selecting **one** *question from each unit.*
All questions carry equal marks. (15 each)

1. Write the short notes on the following :   6×2.5=15

    (a) Central Dogma

    (b) Mitosis

    (c) The functional unit of carbohydrate

    (d) Golden rice

    (e) Molecular vector

    (f) Hybridoma technology

Unit-I

2. What is Biology ? Why should an engineer study
    biology ?   15

3. Write the short note on any *two* :   2×7.5=15

    (a) Evidence of DNA as genetic material

    (b) Mendel's laws of inheritance

    (c) Importance of microbes

3018-P-2-Q-9 (23)   [P.T.O.

Unit-II

4. Write the short note on any *two* : 2×7.5=15
   (a) Phospholipid
   (b) Function of RNA
   (c) Watson and Crick model of DNA

5. What are proteins ? Describe their structure and functions in detail. 15

Unit-III

6. Write the short note on any *two* : 2×7.5=15
   (a) Gene cloning
   (b) DNA modifying enzymes
   (c) Transgenic animal

7. What are transgenic plants ? What is the importance of transgenic plants in the modern era of science ? 15

Unit-IV

8. Write the short note on : 2×7.5=15
   (a) Production and uses of enzymes
   (b) Biotech in Agriculture

9. What is Biotechnology ? What are pre-requirements for biotechnology ? 15

B.Tech. (ME) 3rd Semester (G-Scheme)
Examination, November-2023
PHYSICS-II (OPTICS AND WAVES)
Paper - BSC-ME-201-G

Time allowed : 3 hours]　　　　　[Maximum marks : 75

Note : Attempt *five* questions in all, selecting **one** question from each Section. **Question No. 1 is compulsory.** All questions carry equal marks.

1. (a) What are transverse and longitudinal waves? Give two examples of each.

   (b) Distinguish between interference by division of amplitude and division of wavefront.

   (c) Explain the following terms with an appropriate diagram:

      (i) Spontaneous emission

      (ii) Stimulated emission

   (d) In Young's double-slit experiment the separation of the slit is 1.9×10^{-3} m and the fringe spacing is 0.31×10^{-3} m at a distance of 1 m from the slits. Calculate the wavelength of light.

   (e) Define unit plane and nodal plane.　　　$5 \times 3 = 15$

Section-A

2. (a) Define simple harmonic motion and obtain the differential equation for it. Establish the equation of motion for a simple pendulum and derive the expression for the time period and total energy. 10

   (b) The quality factor of an undamped tuning fork of frequency 256 Hz is 10^3, Calculate the time in which its energy is reduced to $(1/e)$ of its energy in the absence of damping. How many oscillations the tuning fork will make in this time? 5

3. (a) Assuming damping to be proportional to velocity, write the differential equation for the damped harmonic oscillator and find its solution. Discuss under damped, over damped and critically damped oscillations. 10

   (b) A pendulum made of a light spring of length 10 m has a heavy mass of 2 kg. Assuming the oscillations to be of small displacements, find the period of oscillation. 5

Section-B

4. (a) Derive the wave equation for the transverse vibrations of a stretched string and show that speed of the transverse wave is given by

   $$v = \sqrt{T/\rho}$$ 10

   (b) A wave is represented by

   $$y(x,t) = [8 \text{ cm}] \sin[(10 \text{ rad/s})t - (10 \text{ rad/cm}) x]$$

   Determine the amplitude, angular frequency, wave number, wavelength and velocity of the wave. 5

5. (a) If a ray is specified by a 2×1 matrix with elements λ_1 and x_1 when it enters an optical system of refractive index n_1, and is specified by elements λ_1 and x_2 when it leaves the system. The effect of translation is given by

   $$\begin{pmatrix} \lambda_2 \\ x_2 \end{pmatrix} = T \begin{pmatrix} \lambda_1 \\ x_1 \end{pmatrix}$$

   Determine the elements of matrix T for translation through a distance D. 10

   (b) Derive the law of refraction using Fermat's principle. 5

Section-C

6. (a) Explain the formation of Newton's rings by reflected light. Derive the expression for the diameter of the nth dark ring. 10

   (b) In Newton's ring experiment the diameter of the 5th ring was 0.336×10^{-2} m and that of the 15th ring 0.59×10^{-2} m. Find the radius of curvature of the plano-convex lens if the wavelength of light used is 5890 A°. 5

7. (a) Define dispersive power and resolving power of a plane transmission grating and derive the expression for them. 10

(b) What is the highest order spectrum which may be seen with monochromatic light of the wavelength of 4800 A° by means of transmission grating with 2500 lines per inch? 5

Section-D

8. (a) Discuss Einstein's coefficients and derive the relation between them. Explain why high-frequency lasers are not practically possible. 10

(b) Identify and explain the type of pumping source used in the following lasers:

(i) Ruby laser

(ii) He - Ne laser

(iii) Nd: YAG laser

(iv) Co_2 laser 5

9. (a) Describe the principle, construction and working of He- Ne laser with suitable diagrams. 10

(b) Explain the concept of directionality and mono-chromaticity as applied to the lasers. 5

B.Tech. (ME) 3rd Semester (G-Scheme) Examination,

November–2023

MATHEMATICS–III

Paper–BSC-ME-203-G

PDE, Probability and Statistics

Time allowed : 3 hours]   _[Maximum marks : 75_

Note : _Attempt **five** questions in total by selecting **one** from each unit. **Question No. 1** is compulsory._

1. (a) Define Partial Differential equation.   15

   (b) Define initial and Boundary Conditions.

   (c) Write Laplace equation in spherical polar co-ordinates.

   (d) Define conditional probability.

   (e) Define Kurtosis with the help of suitable example.

   (f) Define regression.

3057–P–4–Q–9 (23)   [P.T.O.

Unit–I

2. (a) Solve $x^2(y-z)p + y^2(z-x)q = z^2(x-y)$. 15

   (b) Solve $:= \dfrac{\partial^2 z}{\partial x^2} + \dfrac{\partial^2 z}{\partial x \partial y} - 6\dfrac{\partial^2 z}{\partial y^2} = y \cos x$.

3. Derive D' Alembert's solution of the wave equation. 15

Unit–II

4. Solve the equation $\dfrac{\partial u}{\partial t} = \dfrac{\partial^2 u}{\partial x^2}$ with boundary conditions $u(x, 0) = 3 \sin n \pi x$, $u(0, t) = 0$ and $u(1, t) = 0$, where $0 < x < 1, t > 0$. 15

5. A tightly stretched string with fixed end points $x = 0$ and $x = l$ is initially in a position given by $y = y_0 \sin^3 \dfrac{\pi x}{\ell}$. If it is released from rest from this position, find the displacement $y(x, t)$. 15

Unit–III

6. Explain following terms in short : 15

   (i) Multinomial distribution,

   (ii) Poisson approximation to the binomial distribution,

   (iii) Sums of independent random variables,

   (iv) Moments of Discrete Random variables.

7. Describe the following in detail : 15

   (i) Densities of exponential and gamma distribution functions.

   (ii) Bivariate distributions.

Unit–IV

8. Explain in detail various measures of central tendency. 15

9. A set of five similar coins is tossed 320 times and the result is

No. of heads : 0 1 2 3 4 5

Frequency : 6 27 72 112 71 32

Test the hypothesis that the data follow a binomial distribution. 15

B.Tech. (ME) 3rd Semester (G-Scheme)

Examination, November-2023

BASICS OF ELECTRONICS ENGINEERING

Paper - ESC-ECE-207-G

Time allowed : 3 hours]　　　　　[Maximum marks : 75

Note : Attempt *five* questions in all, selecting *one* question from each Unit. **Question No. 1 is compulsory.** All questions carry equal marks.

1.　(a)　What do you mean by insulators?

　　(b)　What do you mean by Voltage regulation?

　　(c)　Draw the block diagram of 16:1 multiplexer.

　　(d)　What is the need of feedback in amplifier?

　　(e)　What is Barkhausen's criteria for oscillations?

　　(f)　Define digital signal.　　　　$6×2.5=15$

3058-P-3-Q-9(23)　　　　　　　　　　[P.T.O.

Unit-I

2. (a) What is a PN Junction? Draw its V-I
         characteristics in different bias configuration. 10

    (b) Find out the rectification efficiency in half wave
         rectifier.   5

3. (a) Draw the circuit diagram of a CE amplifier and
         explain its input-output characteristics.   10

    (b) What are the various applications of Zener diode?
                                                       5

Unit-II

4. Write short note on: 15

    (a) Op-amp as Integrator

    (b) Op-amp as Differentiator

5. Write short note on: 15

    (a) Op-amp as Summing amplifier

    (b) Op-amp as Difference amplifier

Unit-III

6. What is Barkhausen's criteria for oscillations? Explain
    RC phase shift oscillator using NPN transistor.   15

7. (a) Draw and explain the working of a Wien bridge
         oscillator.   10

    (b) Explain Astable multivibrator in detail.   5

Unit-IV

8. Explain the working of J-K flip flop with truth table.
                                                       15

9. Explain the following: 15

    (a) Full adder

    (b) AM and FM modulation

B.Tech (ME) 3rd Semester (G-Scheme) Examination, November–2023

BASICS OF MECHANICAL ENGINEERING

Paper–ESC-ME-211G

Time allowed : 3 hours]   *[Maximum marks : 75*

Note : *Attempt* ***five*** *questions including* ***Question No. 1*** *which is Compulsory. Select at least* ***one*** *question from each section. Each question carries equal marks.*

1. (a) Define Third law of Thermodynamics.

    (b) Define Hook's law.

    (c) Define Principle of Francis turbine.

    (d) Define Drilling and Milling.

    (e) Define the principle of shaper and planer.

    (f) Define the Rating of Refrigration Machines.

                                         $6 \times 2.5 = 15$

Section–A

2. Explain with neat sketch of Milling machine and also explain the functions of its different parts.   15

3. Explain the formation of steam under constant pressure and also explain the use of steam table.   15

Section–B

4. What is the coefficient of Performance, also explain the working of a simple vapour compression refrigeration cycle with neat sketch.   15

5. Draw the neat sketch of centrifugal pump and also explain its principle and working of it.

Section–C

6. Derive the length of belt of an open belt drive and also explain the various types of belt.   15

7. Explain the stress strain diagram for ductile and brittle material and also explain the Passion's Ratio.   15

Section–D

8. Explain the NC Machine in detail with neat sketch and also explain the advantages and applications of it.

9. Differentiate NC, CNC and DNC machines. What are absolute the incremental methods of Positioning in NC and CNC Machine Tool ?

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B.Tech. 3rd Semester (Mechanical Engg.) (G-Scheme)

Examination, November-2023

THERMODYNAMICS

Paper–PCC-ME-213-G

Time allowed : 3 hours] *[Maximum marks : 75*

*Note : Attempt any **five** questions in all, selecting **one** question from each unit. **Question no. 1** is **compulsory**. All questions carries equal marks.*

1. Explain the following : $6×2.5=15$

   (a) Reversible and irreversible processes

   (b) Internal energy and enthalpy

   (c) Sensible heat and latent heat

   (d) PMM2

   (e) Dryness fraction

   (f) Carnot theorem

Unit-I

2. Derive the expression for work done in various non flow processes. 15

3. (a) What is a PMM1 ? Why is it impossible ? 4

   (b) What is first Law of Thermodynamics ? 4

   (c) Show that work is a path functions and not a property. 7

3060-P-3-Q-9 (23) [P.T.O.

Unit-II

4. (a) Draw phase equilibrium diagram for a pure substance on t-s plot with relevant constant property lines.

   (b) What is critical state ? Explain the terms critical pressure, critical temperature and critical volume of water ? 15

5. Find the specific volume, enthalpy and internal energy of wet steam at 18 bar with dryness fraction (x) = 0.85, by using Steam Tables and Mollier chart. 15

Unit-III

6. 0.8 kg of air flow through compressor under steady state conditions. The properties of air at entry are : pressure 1 bar, velocity 10m/s, specific volume 0.95 kg/m³ and internal energy 30 KJ/kg. The corresponding values at exit are : 8 bar, 6m/s, 0.2kg/m³ and 124KJ/kg. Neglecting the change in potential energy, Calculate the power output and pipe diameter at entry and exit. 15

7. State and discuss the Kelvin-Plank and Clausius statement of Second Law of Thermodynamics. 15

Unit–IV

8. Air enters a compressor at 1 bar, 30°C, which is also the state of environment. It leaves at 3.5 bar, 141° and 90m/s. Neglecting inlet velocity and P.E. effect, Determine :

   (a) Whether the compression is adiabatic or polytropic

   (b) If not adiabatic, the polytropic index

   (c) The isothermal efficiency

   (d) The minimum work input and irreversibility and

   (e) Second law efficiency.

   Take Cp of air = 1.0035kJ/kgK 15

9. Explain the Carnot cycle. Derive its thermal efficiency relation and draw the p-v and t-s diagram. 15

B.Tech. (ME) 3rd Semester (G-Scheme)

Examination, November–2023

ENGINEERING MECHANICS

Paper–ESC-ME-209-G

Time allowed : 3 hours]   _[Maximum marks : 75_

Note : _Attempt any **five** questions in total, at least **one** question from each section. **Question No. 1** is **compulsory.**_

1. Explain following :

    (a) Scalar and vector quantities

    (b) Co-planar force system

    (c) Continuous beam

    (d) Radius of gyration

    (e) Centroid

    (f) Method of section   6×2.5

Section–A

2. (a) The forces 20N, 30N, 40N, 50N and 60N are acting at one of the angular points of a regular hexagon, towards the other five angular points, taken in order. Find the magnitude and direction of the resultant force.

     [P.T.O.

(b) A machine component of length 2.5m and height 1 m is carried upstairs by two men, who hold it by the front and back edges of its lower face. If the machine component is inclined at 30° to the horizontal and weighs 100 N, find how much of the weight each man supports ? 15

3. A circus artist weighing 65kg causes a sag of 9cm in a 11m long rope with an initial tension of 4.5 kN. The artist is at a distance of 3m from one end. What is the change in rope tension ? 15

Section–B

4. Figure shows a truss ABCDE, hinged at C and roller supported at A. At point B a vertical force of 3kN and at D horizontal force of 3kN are applied. Determine the reactions at supports and forces in the members of the truss. 15
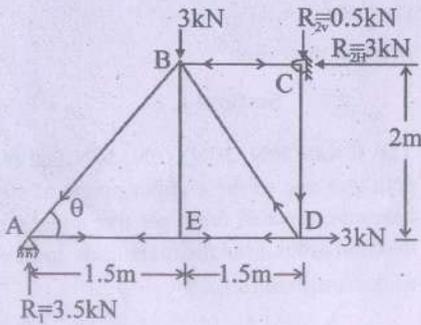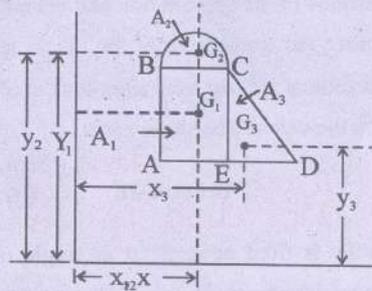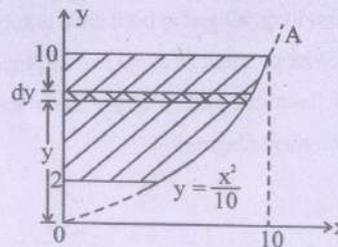
5. Figure ABCDE is a composite section with a rectangular section 4×6cm, semi-circular section of diameter 4cm and a triangular section of base 3cm and height 6cm. The co-ordinates of the edge A are (2, 3). Determine the centroid of the composite section. 15

Section–C

6. Calculate the moment of inertia I_{yy} of the shaded area shown in figure. 15

7. A body moves along a straight line and its acceleration, which varies with time (t) is given by a = 2-3t. After 5 seconds, from start of observations, its velocity is observed to be 20 m/s. After 10 seconds, from start of observation, the body was at 85 meters from the origin. Determine (a) its acceleration and velocity at the time of start ; (b) distance from the origin at the start of observations ; (c) the time after start of observation in which the velocity becomes zero. 15

Section–D

8. A bullet is fired upwards at an angle of 30° to the horizontal from a point P on a hill, and it strikes a target which is 80m lower than P. The initial velocity of bullet is 100 m/s. Calculate the actual velocity with which the bullet will strike the target. 15

9. A beam 5m long, hinged at both ends is subjected to an anticlockwise moment M equal to 60 kNm at a point of 3m away from one end A. Draw the shear force and bending moment diagram. 15