Code No. 14421

FACULTY OF ENGINEERING

B.E. / B.Tech. (Bridge Course) II-Semester (Backlog) Examination, March/April 2021

Subject : Mathematics

Time: 2 hours **Max. Marks: 75**

Note: Missing Data, if any, may be suitably be assumed.

PART – A

Answer any seven questions. **(7x3=21 Marks)**

1 Find the mean of the number 5, 8, 6, 2 occur with frequencies 3, 2, 4, 1 respectively.
2 Define discrete random variable with an example.
3 State Lagrange's mean value theorem.
4 Expand f(x) = e^x in Taylor series about x = -1.
5 Evaluate $\int x \sin x \, dx$.
6 Evaluate $\int_0^1 \int_0^1 (x+y)\, dx\, dy$.
7 Find ∇r^n, where $r = |\vec{r}|, \vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$.
8 Find the curl of $\vec{F} = x\hat{i} + y^2\hat{j} + 2z\hat{k}$.
9 Evaluate $\Gamma(3/2)$.
10 Show that erf(x) + erfc(x) = 1.

PART – B

Answer any three questions. **(3x18 = 54 Marks)**

11 (a) Find the mean, median and mode for the numbers
3, 5, 2, 6, 5, 9, 5, 2, 8, 6
(b) If $P(A) = 0.6$, $P(B) = 0.5$ and $P(A \cap B) = 0.3$, find
$P(\overline{A}), P(\overline{B}), P(A \cup B), P(\overline{A} \cap B), (\overline{A} \cap \overline{B})$ and . $P(\overline{A} \cup \overline{B})$

12 (a) Verify Cauchy's mean value theorem for the functions e^{-x}, e^x in [2, 8].
(b) Find the envelope of the family of lines $y = mx + m^3$.

13 (a) Find the volume of the solid generated by the revolution of the curve $(a - x)y^2 = a^2x$ about $x = a$.
(b) Evaluate $\int_0^{\ell oga} \int_0^{\ell ogb} \int_0^{\ell ogc} e^{x+y+z}\, dx\, dy\, dz$.

14 (a) Find the directional derivative of f(x, y, z) = $x^2 + y^2 + z^2$ at (1, 2, 3) in the direction of the vector $2\hat{i} + 3\hat{j} + 6\hat{k}$.
(b) If $\vec{F} = (2x + 6y^2)\hat{i} - 10yz\hat{j} + x^2z\hat{k}$, evaluate $\int_C \vec{F} \cdot d\vec{r}$ from (0, 0, 0) to (1, 1, 1) along the path $x = t$, $y = t^2$, $z = t^3$.

15 (a) Evaluate $\int_0^{\pi/2} \sqrt{\cot\theta}\, d\theta$ using Beta and Gamma functions.
(b) Prove that $\beta(m,n) = \int_0^{\infty} \frac{x^{m-1}}{(1+x)^{m+n}} dx$.

16 (a) State and prove Rolle's theorem.
(b) Find the evolute of the curve $xy = 1$.

17 Verify Green's theorem in the plane for $\oint_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where C is the boundary of the region defined by $x = 0$, $y = 0$ and $x + y = 1$.

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Code No. 14504/CBCS

FACULTY OF ENGINEERING

B.E. I-Semester (CBCS) (Backlog) Examination, March/April 2021

Subject : Engineering Physics – I

Time: 2 hours **Max. Marks: 70**

Note: Missing Data, if any, may be suitably be assumed.

PART – A

Answer any five questions. **(5x2 = 10 Marks)**

1 What do you mean by coherent sources?
2 Why do radio waves different around buildings, although light waves do not?
3 Define : (i) Half wave plate (ii) Population inversion
4 List any four applications of holography.
5 An optical fiber has a core material of refractive index of 1.55 and cladding material of refractive index 1.50. The light is launched into the fiber from air. Calculate its numerical aperture.
6 Mention any four applications of ultrasonic waves.
7 Define (i) Canonical ensemble (ii) Micro canonical
8 What do you mean by phase-space?
9 Calculate the wavelength associated with 1MeV electron.
10 What do you mean by displacement current?

PART – B

Answer any four questions. **(4x15 = 60 Marks)**

11 (a) Describe the formation of Newton's Rings in reflected light. Prove that in reflected light the diameters of the dark rings are proportional to the square roots of natural numbers.
(b) Calculate the possible order of spectra with plane transmission grating having 18,000 lines per inch when light of wavelength 4500 $\mathring{A}$ is used.

12 (a) Explain the principle, construction and working of Nicol prism with neat diagram.
(b) Explain the working of He-Ne laser with the help of a neat energy level diagram.

13 (a) Explain what is step-index and graded index of optical fibre with neat diagram.
(b) Describe the method of measuring velocity of ultrasonic waves in liquid using Debye-Sears method.

14 Derive Planck's radiation law. Show how it limits to the Wein's and the Rayleigh-Jeans law in their specific limits.

15 Establish the one-dimensional Schrodinger wave equation for a particle confined in a box, and hence give the discrete energy levels that are available to the particle.

16 (a) Write the Maxwell's equations in integral and differential forms.
(b) Discuss the Fraunhoffer diffraction at a single slit. Obtain the condition for principal maximum and minimum.

17 (a) State and prove Poynting theorem.
(b) Write any four applications of (i) Lasers and (ii) Optical fibers

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